Draft Final

Environmental Assessment for CV-22 Beddown

Hurlbut Field, Florida

May 2001

DRAFT-FINAL
FINDING OF NO SIGNIFICANT IMPACT
CV-22 BEDDOWN
HURLBURT FIELD, FLORIDA

Agency: Air Combat Command (ACC), and 16th Special Operations Wing (16 SOW)

Background: Pursuant to the Council on Environmental Quality (CEQ) regulations, the provisions of the National Environmental Policy Act of 1969 (NEPA) (40 Code of Federal Regulation Parts (CFR) 1500-1508), and Air Force Instruction (AFI) 32-7061 as promulgated in 32 CFR 989, the U.S. Air Force conducted an assessment of the potential environmental consequences resulting from beddown and operation of the CV-22 Osprey at Hurlburt Field, Florida. The purpose of the Proposed Action is to replace the existing MH-53 helicopters with a crisis response aircraft capable of extended operating ranges, faster operating speeds, and the ability to take off and land vertically. The Environmental Assessment (EA) considers all potential impacts of the Proposed Action and the No Action Alternative, both as solitary actions and in conjunction with other activities. This Finding of No Significant Impact (FONSI) summarizes the results of the evaluations of the Proposed Action. The discussion focuses on activities that have the potential to change both the natural and human environments.

Proposed Action and No Action Alternative: The EA, which is hereby incorporated by reference, assesses the environmental impacts associated with the beddown and operation of the CV-22 Osprey at Hurlburt Field.

The potential environmental effects associated with the Proposed Action and No Action Alternative were assessed for the following environmental resources: air quality; air space; noise; wastes, hazardous materials and stored fuels; safety and occupational health; water resources; biological resources; geology and soils; cultural resources; land use; environmental justice; and indirect and cumulative impacts. Cumulative effects resulting from the overlap of the Proposed Action with other planned activities and other reasonably foreseeable actions also were assessed.

Resources not assessed in the CV-22 Beddown EA included transportation, utilities, and socioeconomics (other than environmental justice). These resources were determined to have no or inconsequential impacts and were not considered in the EA.

Crisis response requires aircraft with extended range and speed capabilities and the ability to take off and land vertically. The CV-22 Osprey's vertical take off and landing capabilities, faster operating speeds, and its ability to travel greater distances than the current helicopter fleet make it more capable than the helicopters currently in service. The aircraft will have terrain-following and terrain-avoidance radar, extended-range fuel tanks, an integrated navigation system, and a reduced acoustic noise level. Because of these capabilities, the CV-22 Osprey would not only replace the MH-53's role in medium-lift operations, but provide the USAF with enhanced operational capabilities.

Under the No Action Alternative, the Air Force would not go forward with the beddown of the CV-22 Osprey at Hurlburt Field. Selection of the No Action Alternative would result in the continued use of the MH-53 helicopters by the 16 SOW and the USAF.

Construction and operational activities associated with the Proposed Action would affect the existing environment. The primary effects from construction relate to changes in air quality, biological resources, hazardous materials and waste management, water resources, geology and soils, and noise. The primary beneficial effects from the operation of the Proposed Action relate to safety and occupational health, hazardous materials and waste management, and noise.

Air emissions estimated for construction activities resulting from the Proposed Action would be temporary and decrease with distance from the Proposed Action site; therefore, no significant adverse effects on the regional air quality would occur. All facility construction would occur in previously developed areas, minimizing effects to biological resources. Construction activities would increase noise levels adjacent to the work sites; however, noise effects would be short-term and limited to daytime hours. Cumulative effects would not be significant.

Air emissions estimated for operational activities would not adversely affect regional air quality. Anticipated missions during the operation of the Proposed Action are not estimated to constitute a hazard to human health. Air emissions and noise are not anticipated to constitute hazards to wildlife in the vicinity. Hazardous materials and wastes would be managed in accordance with applicable regulations and installation guidelines. Noise from the Proposed Action would be consistent with the current noise environments on the installations. Cumulative effects would not be significant.

The majority of the environmental impacts of the Proposed Action would occur within the boundary of the Hurlburt Field and would neither have an impact on low-income or minority populations, nor constitute a disproportionate impact to low income or minority populations in Okaloosa County. Noise levels during training missions are projected to remain essentially the same as baseline conditions. There would be no environmental justice impacts associated with the Proposed Action.

There are no direct, indirect, or cumulative impacts associated with the Proposed Action or the No Action Alternative. Under the Proposed Action, in addition to on-going and planned projects, there would be no cumulative environmental impacts. While there are other aircraft missions in the vicinity of the Proposed Action, the de minimis environmental effects from this project, coupled with other ongoing/planned projects, would not create any cumulatively significant impacts on the environment.

There are no adverse, unavoidable impacts associated with the implementation of the preferred alternative.

FINDING OF NO SIGNIFICANT IMPACT: Based upon my review of the facts and analyses contained in the attached Environmental Analysis, I conclude that implementation of the Proposed Action will not have a significant environmental impact, either by itself or cumulatively with other projects at Hurlburt Field. Accordingly, the requirements of NEPA, the regulations promulgated by the Council on Environmental Quality and 32 CFR 989 are fulfilled and an Environmental Impact Statement is not required. A Notice of Availability for public review was published in the local newspaper on 14 May 2001. The signing of this Finding of No Significant Impact (FONSI) completes the Air Force's environmental impact analysis process.

RICHARD L. COMER, Brigadier General, USAF   DATE
HQ AFSOC Vice Commander

Attachment: Environmental Assessment

COVER SHEET
DRAFT ENVIRONMENTAL ASSESSMENT
CV-22 BEDDOWN AT HURLBURT FIELD, FLORIDA

a. Responsible Agency: Department of the Air Force

b. Proposed Action: CV-22 Beddown at Hurlburt Field, Florida.

c. Written comments and inquiries regarding this document should be directed to: Jonathan D. Farthing, HQ AFCEE/ECA, 3207 North Road, Brooks Air Force Base (AFB), Texas 78235-5363, (210) 536-3787.

d. Report Designation: Draft Environmental Assessment (EA).

e. Abstract: The purpose of the Proposed Action is to beddown and operate up to 28 CV-22 Osprey aircraft at Hurlburt Field, Florida. This EA analyzes the potential environmental effects that could be generated from: bedding down the CV-22s, retiring existing MH-53s and previously based MH-60s, constructing a facility to house flight simulators and train pilots, demolishing Building 91025, modifying existing hangar facilities to accommodate the CV-22 aircraft and maintenance activities. It also analyzes the potential environmental effects associated with operating the CV-22 which includes: conducting readiness operations, low altitude tactical navigation, detection avoidance, low-level instrument meteorological navigation, water operations, terrain-following exercises, night vision goggle training, gunnery and combined arms exercises, and other activities. The No-Action Alternative would be not to conduct the CV-22 Beddown at Hurlburt Field, Florida.

This EA analyzes the potential environmental impacts from proposed activities on air quality, airspace, biological resources, bird-aircraft strike hazard, cultural resources, geology and soils, hazardous materials and waste management, land use, noise, and water resources. Although not required under NEPA, the EA also analyzed environmental justice, the effects the beddown and operation of the CV-22 would have on minorities and low income populations living within the affected area. The Air Force has determined that the impacts to these resources would not be significant.

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Section 1.0 Purpose and Need

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SECTION 1.0
PURPOSE AND NEED

The United States Air Force (USAF) has prepared this Environmental Assessment (EA) to assess the potential environmental effects resulting from beddown and operation of the CV-22 Osprey at Hurlburt Field (HF), Florida. The aircraft would be assigned to the 16th Special Operations Wing (16 SOW). The mission of the 16 SOW, the only Special Operations Wing in the Air Force Special Operations Command (AFSOC), is to organize, train, and equip Air Force Special Operations for global employment. Beddown (Figure 1-1) of the CV-22 Osprey at Hurlburt Field is part of an Air Force initiative to field newer, more capable aircraft and retire existing aircraft, i.e., the MH-53J Pave Low III and MH-60G Pave Hawk helicopters.

1.1 Background

The upheaval following the end of the Cold War has resulted in an ever-increasing demand for Special Operations Forces around the globe, in missions spanning the spectrum from peacekeeping to warfighting. AFSOC, as the air component of United States Special Operations Command (USSOCOM), has a requirement to quickly insert and/or extract special operations forces and American citizens behind enemy lines or contested airspace. These missions require an aircraft with the ability to fly fast, travel great distances, defend itself, and take off or land vertically. The CV-22 has the capability to provide special operations forces with the increased speed and range and low-altitude adverse weather/hostile territory penetration capabilities that normally would require both fixed wing and rotor wing aircraft. When the CV-22 is fully deployed, AFSOC will have divested its helicopter fleet with the CV-22 aircraft.

FIGURE 1-1

CV-22 OSPREY IN FLIGHT

1.2 Purpose and Need

1.2.1 Purpose

Headquarters AFSOC proposes to beddown and operate up to 28 CV-22 Osprey aircraft at Hurlburt Field, Florida. The beddown would be conducted over a 9-year period beginning in 2004 (Table 1.2-1). Specific activities to be performed

Table 1.2-1 CV-22 Deployment Schedule

Aircraft and Squadron	**Fiscal Year**											
	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**
CV-22 (SQ. 1)				4/0	7/1	7/1	7/1	7/1	7/1	7/1	8/1	8/1
CV-22 (SQ.2)								4/0	4/1	7/1	8/1	8/1
18 FLTS					1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0
CV-22 (SQ.3)											4/0	8/1
CV-22 Totals				**4**	**9**	**9**	**9**	**13**	**14**	**17**	**23**	**28**

as part of the Proposed Action include the following:

- Assignment of up to 28 CV-22s to 16 SOW.
- Retirement of existing MH-53s and previously based MH-60s and field with the CV-22 on nearly a one-for-one basis.
- Construction of a 3-story, 130,000 square foot expansion to Building 91029 in FY07 to house flight simulators and train pilots.
- Demolition of Building 91025 to accommodate the expansion.
- Modification of existing hangar facilities, Buildings 91262 and 91266, to accommodate beddown of the CV-22 aircraft and maintenance activities.
- Conduct of readiness operations to develop proficiency in the use of the CV-22 aircraft.

The types of training exercises and readiness operations to be conducted by AFSOC with the CV-22 include, but are not limited to:

- Low altitude tactical navigation
- Detection avoidance

- Low-level instrument meteorological navigation
- Water operations
- Terrain-following exercises
- Night vision goggle (NVG) training
- Gunnery and combined arms exercises

1.2.2 Need

The USAF needs to retire existing Special Operations Command MH-53 and MH-60 helicopters and field the CV-22 Osprey and train its personnel in the deployment and operation of the CV-22. The basis for this need is:

- AFSOC, located at Hurlburt Field, is responsible for organizing, training, equipping, and educating USAF special operations forces. Consequently, it has an urgent operational requirement to be prepared for the arrival of the CV-22.
- MH-60 and MH-53 helicopters are nearing the end of their service lives. MH-60 helicopters have been retired in anticipation of CV-22 procurement. MH-53 helicopters would be phased out as CV-22s are delivered. With its ability to travel large distances at high speeds, at night, and under adverse weather conditions, the CV-22 would provide greatly increased operational capabilities.

1.2.3 Screening Criteria

To evaluate the selection of alternatives to the proposed action, screening criteria were developed by the USAF to select a location to beddown the CV-22 that would provide access to appropriate training facilities and ranges and would be in the general proximity to other DoD forces. Screening criteria used in the selection process are listed below:

- To maximize multi-ship training and integration, the beddown location should be collocated or in near proximity to other current USAF Special Operations aircraft.

- The beddown location should have access to flying training routes in mountainous terrain.
- The beddown location should have access to nearby gunnery ranges.
- To assure operational readiness, the beddown location should have access to nearby electronic countermeasures (ECM) ranges.
- To assure operational readiness, the beddown location should have access to nearby ocean drop training areas.
- To assure operational readiness, the beddown location should support night operations while minimizing disturbance to the public.
- To minimize financial and environmental impact, the beddown location should maximize use of existing facilities.

Hurlburt Field was targeted as the most appropriate location for beddown and operation of the CV-22 because it met the conditions of the screening criteria and offered physical facilities that required minimal alteration. The use of Eglin AFB as a beddown location for the CV-22 Osprey was evaluated and eliminated from further consideration due to its lack of appropriate facilities.

1.3 Location of the Proposed Action

Beddown of the CV-22 would be accomplished at Hurlburt Field, Florida. Hurlburt Field is located on 6,634 acres in Okaloosa County within the Florida Panhandle (Figure 1-2). The installation is approximately 35 miles east of Pensacola and 11 miles west of the Eglin Air Force Base main complex. The proposed beddown would be accommodated at hangar facilities in Buildings 91262 and 91266 where renovations are proposed. A proposed construction/expansion project would accompany the beddown of the CV-22 at Building 91029 where the flight simulators would be housed. Building 91025 would be demolished to make room for the expansion. The CV-22 parking area would be at the site of the existing Combat Aircraft Parking Area (Helicopter). All of the expansion and construction projects would occur on base. Figure 2-1 illustrates the location of the proposed modifications.

Training and tactical operations for the CV-22, Osprey aircraft would be conducted at established outlying landing fields; established special airspace such as military operation areas; and established landing zones and target areas. The training missions would be flown along approved military training routes (MTRs) and conducted within a low altitude tactical navigation (LATN) area, which encompasses parts of Florida, Georgia, Alabama, South Carolina, North Carolina, and Tennessee.

Other locations were considered as a beddown option for the CV-22 Osprey. However, they were not analyzed further because they were not reasonable in light of the screening criteria. The criteria are listed in the Purpose and Need Section (1.2) of this EA.

1.4 Decisions to be Made

The USAF must decide among the following options: (a) beddown of the three special operations squadrons utilizing the CV-22 Osprey and retirement of the MH-53 and MH-60 helicopters at Hurlburt Field and (b) no action. If the CV-22 beddown option is selected, both the MH-53s and the previously based MH-60s would be retired. If the No Action Alternative is selected, the MH-53s would remain in active status at Hurlburt Field; however, the MH-60s would not be returned.

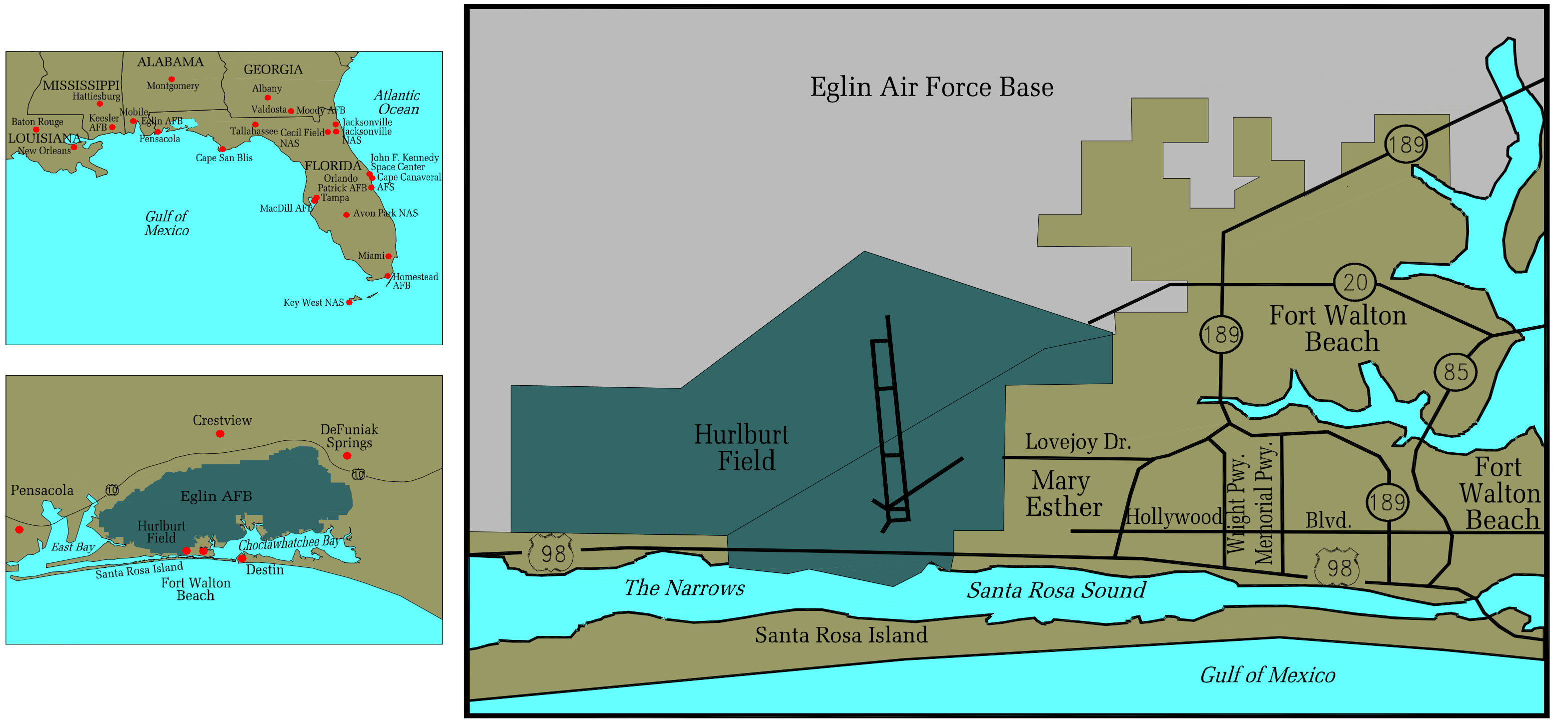

FIGURE 1–2

LOCATION MAP

HURLBURT FIELD AFB, FLORIDA

1.5 Scope of the Environmental Review

The scope of this EA is "issue driven," meaning that it concentrates only on discussion of those resources that may be adversely impacted by the activities associated with the beddown and operation of CV-22. The potential environmental effects generated by these activities could affect airfield operations and airspace (including bird-aircraft strike hazard and safety), noise levels, air quality, geology, water resources, land use, hazardous materials and wastes, biological resources, cultural resources and environmental justice. Detailed descriptions of the affected environment and the potential environmental consequences relative to these resources are presented in Sections 3.0, *Affected Environment* and 4.0, *Environmental Consequences*. The Air Force has examined other resource areas and conditions and found that the Proposed Action would either have no or inconsequential impact. These resource areas include transportation (ground), utilities (usage), and socioeconomics (other than environmental justice). The reasons for not addressing these resources are presented in the following paragraphs and are not further discussed in this EA.

Transportation. There are no roadway modifications or upgrades proposed in support of CV-22 beddown. The number of operational personnel required to support CV-22 beddown would not change from the existing conditions. Modification of the existing Training Device Support Facility, Building 91029, would be required to accommodate CV-22 simulator and training activities. However, this activity would be of short duration, and would not significantly increase existing surface traffic travel within or outside of Hurlburt Field. For these reasons, transportation impacts are not expected and are not analyzed in further detail.

Utilities. Modification of existing facilities would be required to support CV-22 beddown; however, based on the projected equipment inventory to be contained in the facilities, and the projected usage and maintenance requirements, no increase in utility consumption at Hurlburt Field is anticipated as a result of the Proposed Action. Furthermore, as utility services currently exist at the buildings that would be modified for simulator training and hangar facilities, no new routing of utility services into or out of the training and hangar facilities is projected. For these reasons, impacts to utility systems are not expected and are not analyzed in further detail.

Socioeconomics. The increase to the worker population that would be associated with the construction activities required to implement the Proposed Action represents a short-term increase in the workforce that would not result in a noticeable change in base or regional employment of population. The additional construction personnel required for facility modifications would range from 40 to 60 people during peak construction periods. This represents less than a five percent increase in the base daytime workforce. At any given time during the facility modifications, there would be far fewer construction personnel present on base.

The number of staff required to support CV-22 operations would decrease by 46 personnel from that presently supporting MH-53 and MH-60 operations during the baseline year (Table 1.2-2). In addition, the total number of operational support personnel for wing aircraft would decrease by approximately 204 personnel during the period 1999 through 2012, resulting in an 8.9 percent decrease in the total number of operational personnel supporting Hurlburt Field aircraft operations. For these reasons, significant impacts to socioeconomics are not expected and are not analyzed in further detail.

Table 1.2-2. Manpower Projections in Support of Hurlburt Field Aircraft Operations, FY1999 through FY2012

Aircraft Type	Fiscal Year					
	1999 (base)	2000	2003	2006	2009	2012
MH-53	893	891	678	429	0	0
MH-60	140	0	0	0	0	0
CV-22	0	0	38	292	544	987
Total helicopter	**1033**	**891**	**716**	**721**	**544**	**987**
Total fixed wing (MC-130s)	1334	1071	1119	1131	1130	1130
Aircraft total	**2367**	**1962**	**1835**	**1852**	**1674**	**2117**

1.6 Related EISs and EAs

Several recently prepared NEPA documents are directly related to the Proposed Action. These include:

1) (*Final Environmental Impact Statement for Introduction of the CV-22 to the Second Marine Aircraft Wing Stationed in North Carolina)*. This EIS addresses introduction of a similar aircraft as the CV-22 to a different branch of the military and provides an excellent description of anticipated environmental impacts.
2) (*Final Environmental Assessment for the Proposed Expansion of the 16th Special Operation Wing Low Altitude Tactical Navigation Array Addition of SR-119 Training Route and the Addition of Helicopters to IR-057 and IR-059 Training Routes {March 1994}.* This document provides descriptions of existing flight training operations and data on training routes at Hurlburt Field.
3) *(Draft Environmental Assessment of Proposed Actions by the 58th Special Operations Wing at Kirtland Air Force Base {April 2000}.* This EA addresses the introduction of the CV-22 to Kirtland AFB for initial operational testing and evaluation and beddown. It provides descriptions of the environmental

consequences associated with the aircraft including noise, air quality, airspace and bird-aircraft strike hazards.

1.7 Applicable Regulatory Requirements and Coordination

This environmental analysis has been conducted in accordance with the President's Council on Environmental Quality (CEQ) regulations, Title 40 of the Code of Federal Regulations (CFR) §§1500-1508, as they implement the requirements of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. §4321, *et seq.*, and Air Force Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, as promulgated in 32 CFR Part 989. 32 CFR 989 addresses implementation of NEPA and directs Air Force officials to consider environmental consequences as part of the planning and decision-making process.

These regulations require federal agencies to analyze the potential environmental impacts of the proposed action and alternatives and to use these analyses in making decisions on a proposed action. Cumulative effects of other ongoing activities also must be assessed in combination with the Proposed Action. The CEQ was instituted to oversee federal policy in this process. The CEQ regulations declare that an EA is required to accomplish the following objectives:

- Briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).
- Aid in an agency's compliance with NEPA when an EIS is not necessary and facilitate preparation of an EIS when necessary.

AFI 32-7061 as promulgated in 32 CFR 989 specify the procedural requirements for the implementation of NEPA and preparation of the EA.

Other environmental regulatory requirements relevant to the Proposed Action and alternatives also are identified in this EA. Regulatory requirements under the following programs, among others, will be assessed: Noise Control Act of 1972; Clean Air Act (CAA); Clean Water Act (CWA); National Historic Preservation Act; Endangered Species Act of 1973; Coastal Zone Management Act; Resource Conservation and Recovery Act (RCRA); Toxic Substances Control Act (TSCA) of 1970; and Occupational Safety and Health Act. Requirements also include compliance with Executive Order (EO) 11988, Floodplain Management; EO 11990, Protection of Wetlands; and EO 12898, Environmental Justice.

1.8 Organization of the EA

The EA is organized into eight sections and eight appendices. Section 1.0 contains a statement of the purpose and need for the Proposed Action; defines the location of the Proposed Action; states the decision to be made; presents the scope of the environmental review; and outlines the organization of the EA. Section 2.0 of the EA describes the Proposed Action and the No Action Alternative and presents a comparison of any potential environmental consequences from these alternatives. Section 3.0 describes the existing environment of the project site at Hurlburt Field and offsite training routes. These descriptions provide a framework for assessing the potential environmental impacts of the Proposed Action and the No Action Alternative discussed in Section 4.0. Section 5.0 lists the preparers of the EA, and Section 6.0 identifies the persons and agencies consulted in the preparation of the document. Section 7.0 is a list of source documents relevant to the preparation of this EA. Section 8.0 is a list of acronyms. Appendices to be contained in the EA include:

- Appendix A --Supplemental Design and Operational Information on the CV-22 Osprey;
- Appendix B --Noise Analysis;
- Appendix C --Consistency Statement;

- Appendix D -- Transmittal Letters (To Be Added)
- Appendix E -- Agency Comment Letters
- Appendix F -- Public Notice (To Be Added)
- Appendix G -- Air Space Analysis
- Appendix H -- Threatened, Endangered, and Species of Special Concern Tables

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SECTION 2.0
DESCRIPTION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section describes the activities associated with the Proposed Action, No Action Alternative, alternatives considered but eliminated, and concludes with a comparison of environmental effects of the Proposed Action and No Action Alternative.

2.1 Detailed Description of the Proposed Action

The U.S. Department of the Air Force proposes to:

- Beddown and operate up to 28 CV-22 aircraft at Hurlburt Field, Florida. These aircraft would be assigned to the 16 SOW, AFSOC.
- Retire existing MH-53 and previously based MH-60 helicopters and field the CV-22 on nearly a one-for-one basis.
- Construct a 3-story, 130,000 square foot expansion of Building 91029 in FY07 to house flight simulators and train pilots.
- Modify existing hanger facilities, Buildings 91262 and 91266, to accommodate beddown of the CV-22 aircraft and maintenance activities.
- Conduct sortie-operations by CV-22 aircraft within Eglin AFB Military Operations Areas (MOAs), Low Altitude Tactical Navigation (LATN) areas, ranges, and along existing Military Training Routes (MTRs). A sortie consists of a single military aircraft flight from initial takeoff through final landing.

Under the Proposed Action, beddown of the CV-22 Osprey at Hurlburt Field would be conducted over a 9-year period beginning in FY04 with the delivery of four aircraft. An additional five aircraft would be delivered in FY05. Ultimately, up to 28 CV-22s would be assigned to the 16 SOW. The CV-22 would utilize the same airspace as currently used for MH-53 training, however, there would be an increase in the number of flights flown per year by the CV-22 on MTRs and ranges. The proposed changes in airspace would not require changes to the structure of MTRs or range used by Hurlburt Field aircraft. As part of the Proposed Action, building renovations and construction would be necessary to support CV-22 operations.

A summary of the CV-22 mission and capabilities is provided in Section 2.1.1. Proposed facility modifications, aircraft operations, and personnel requirements are described in Sections 2.1.2, 2.1.3, and 2.1.4, respectively.

2.1.1 Mission, Capabilities and Description of the CV-22 Osprey

The V-22 tilt-rotor aircraft is a joint multi-mission vertical-lift aircraft (JMVX) that will provide the USAF/USSOCOM with a multi-engine, dual-piloted, self-deployable, medium lift, vertical takeoff and landing aircraft to conduct combat, combat support, combat service support, and special operations missions worldwide. The V-22 tilt-rotor, referred to as the Osprey, entered the DoD inventory in May 1999 when the first MV-22 was delivered to the U.S. Marine Corps. The aircraft will be fully capable of operations in adverse weather; day or night; in climates from arctic to tropical; and in a variety of conventional, unconventional and contingency combat situations, including nuclear, biological and chemical (NBC) warfare (USAF, 1999b).

The CV-22 Osprey aircraft will use terrain-following terrain-avoidance radar, a forward-looking infrared receiver, precision navigation and state-of-the-art active and passive defensive countermeasures to accomplish SOF missions. These features will allow the aircraft to operate at night in adverse weather conditions (USAF, 2000f). The aircraft will operate from air-capable ships, as well as shore sites ranging from main bases to forward operating locations. An in-flight refueling capability will extend its combat mission range when required, and the aircraft would be self-supporting to the maximum practical extent (USAF, 1999b).

The CV-22 Osprey is designed to transport up to 24 combat-equipped troops or approximately 10,000 pounds of cargo, dual-hook external loads up to 15,000 pounds. The CV-22 operates at cruise speeds in excess of 230 knots, and has a combat unrefueled mission radii of 500 nautical miles (USAF, 1999b; USAF, 2000f).

2.1.2 Modification of Facilities

Beddown and deployment of three CV-22 squadrons would create a need to modify existing facilities at Hurlburt Field. The location of facilities requiring modification is shown in Figure 2-1. Proposed facility modifications are described below:

- CV-22 Training Device Support Facility (TDSF) – This project includes a new 3-story (130,000 square foot) addition to Building 91029. The facility would house flight simulators and related activities in a single structure. The addition would include a concrete foundation, floor slab, masonry walls, and steel frame with a sloping metal roof. The site of the new addition would require the demolition of the existing combat Weather Facility Building 91025 to make room for parking for the new addition. A total of two flight simulators would be installed in the TDSF. Total simulator use is projected to be 300 hours per month (6 hours per pilot per month). Estimated construction cost is $10,200,000.

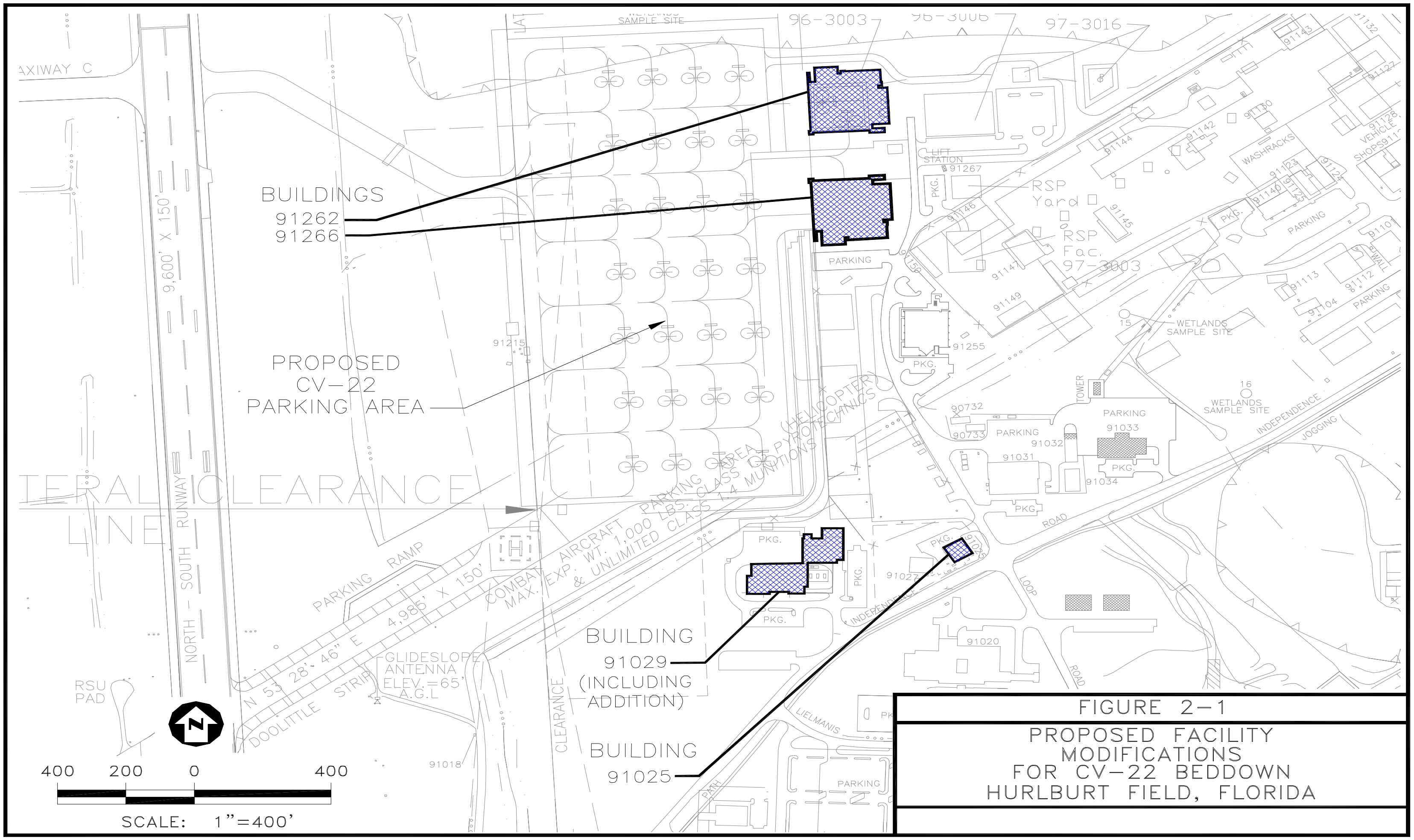


FIGURE 2–1
PROPOSED FACILITY MODIFICATIONS FOR CV-22 BEDDOWN HURLBURT FIELD, FLORIDA

Hurlburt Field Environmental Assessment

- Hangar Modifications – Steel hangar doors would be fabricated and installed on Buildings 91262 and 91266 to accommodate the CV-22. This project would provide interior access to a third hangar for maintenance activities that currently are performed outside. The project would involve upgrading the electrical system of the two hangars. Airfield markings would be modified to provide proper clearance. The estimated cost is $2,050,000.

Hurlburt Field currently has suitable aircraft rinse, washrack, fuel storage, and direct fueling and defueling facilities to accommodate the CV-22. Therefore, no modifications to these support facilities are planned as part of the Proposed Action. Additionally, the aircraft taxiways at Hurlburt Field were recently widened and are well-suited to accommodate the 85-foot wingspan of the CV-22.

2.1.3 CV-22 Operations

Training and readiness operations for the CV-22 would be similar to those for the MH-53 and MH-60 helicopters, with some additional flights during initial training designed to acquaint the CV-22 aircrews with the expanded capabilities of the new aircraft. Operations would fall into three general categories: initial or familiarization training that is designed to instruct new pilots or acquaint pilots of other aircraft with the operation of the CV-22; tactical training that is designed to teach aircrews the tactical employment of the CV-22; and integrated training that is designed to teach aircrews how to combine CV-22 operations with other USAF and DoD Special Operations initiatives.

The CV-22 is a new aircraft with essentially no operational experience to date, other than initial prototype testing. The USAF has made reasonable assumptions about the number and types of training and readiness operations that would be performed, based on operations performed for the MH-53 and MH-

60 helicopter squadrons. As experience is gained over the next few years, the USAF will reevaluate its assumptions and revise them if necessary. The following sub sections (2.1.3.1 and 2.1.3.2) provide a description of the airspace and projected number of sorties to be flown by the CV-22.

2.1.3.1 Low Altitude Tactical Navigation Area (LATN) and Military Training Routes.

LATN: The LATN at Hurlburt Field encompasses six states, Florida, Alabama, Georgia, North Carolina, South Carolina and Tennessee (See Figure 2-2). These states provide 16 SOW with variety of terrain on which to train flight crews. The area currently is used by the 16 SOW for C-130, and MH-53 operations. Aircraft fly between 250 and 1,500 feet above ground level (AGL) at airspeeds ranging from 120 to 250 knots. No changes are anticipated in the LATN area.

MTRs: MTRs are used for training below 10,000 feet at airspeeds in excess of 250 knots. The routes have operational restrictions. 16 SOW currently uses two MTRs, IR-057 and IR-059, for MH-53 training at Hurlburt Field, but anticipates using only the slow-speed, low-altitude MTRs SR-119 and SR-101 for CV-22 training. All flights on SR-119 are flown under Visual Flight Rule (VFR) conditions, and maintain a 250 to 1,500 feet elevation AGL at an estimated airspeed of 230 to 240 knots (USAF, 1994). Flights on SR-101 have an average speed of 230 knots and have a minimum altitude of 250 feet AGL. Both routes encompass parts of Florida, Alabama, Georgia, North Carolina, and Tennessee.

The number of flights currently flown by 16 SOW aircraft, and the anticipated number of flights following CV-22 deployment are detailed in Table 2.1-1. At full deployment in FY12 the projected number of CV-22 flights on MTRs would decrease approximately 9 percent over the baseline condition. MTRs are described in more detail in Section 3.2.3.3. Figure 2-3 shows the anticipated

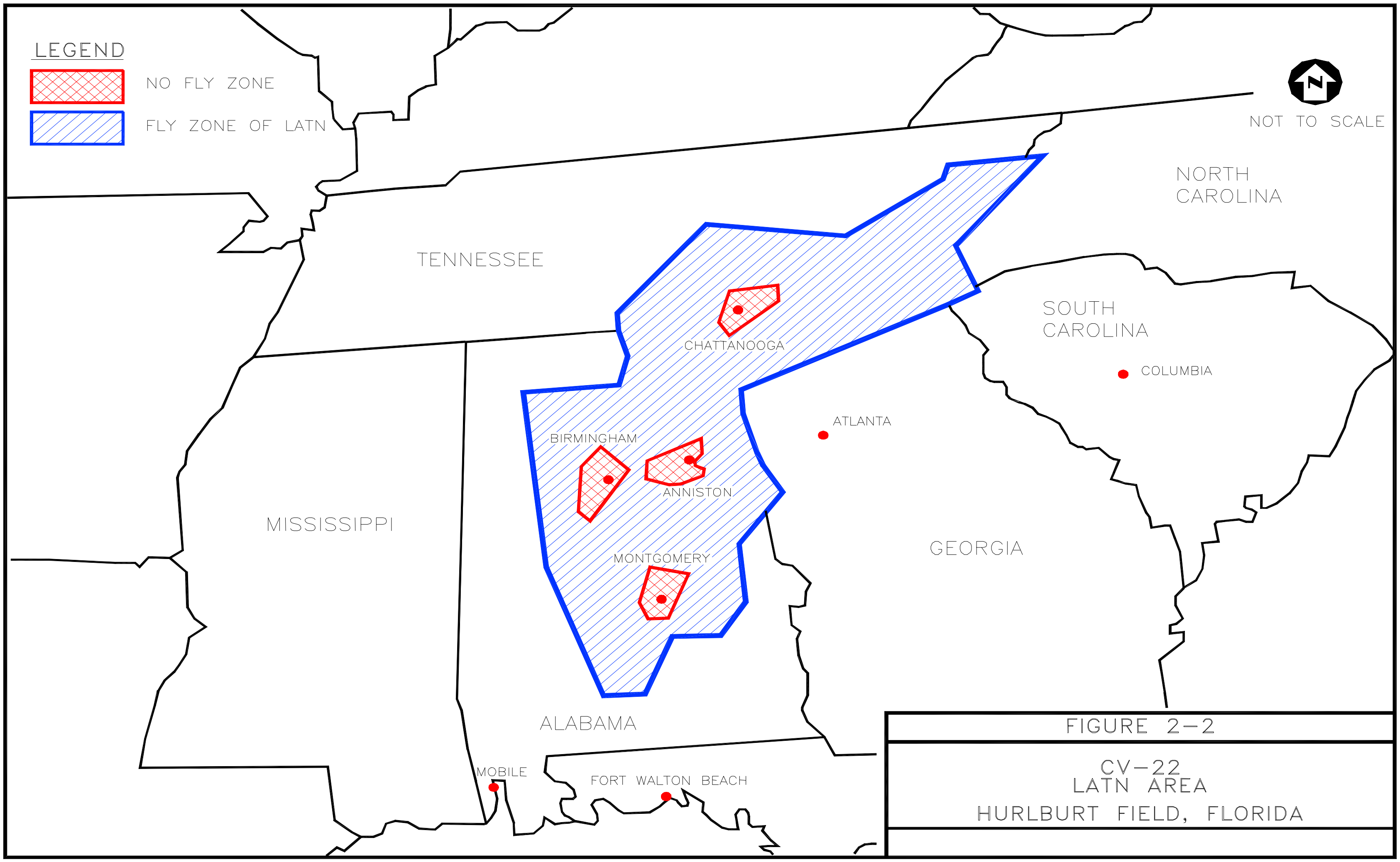


FIGURE 2–2
CV–22
LATN AREA
HURLBURT FIELD, FLORIDA

training routes SR-101 and SR-119, that the CV-22 Osprey would utilize at Hurlburt Field.

Table 2.1-1: **Proposed Flight Training Operations at Hurlburt Field For Baseline and Proposed Conditions**

Route	Aircraft	Sorties Per Year	
		Existing Conditions (FY99)	**CV-22 Beddown (FY12)**
LATN	C-130	680	600
	MH-53	288	0
	MH-60	72	0
	CV-22	0	0
IR-057	C-130	12	12
	MH-53	78	0
	CV-22	0	0
IR-059	C-130	12	12
	MH-53	78	0
	CV-22	0	0
SR-101	C-130	10	0
	CV-22	0	0[1]
SR-119	C-130	680	600
	CV-22	0	468
Total	Helicopter	516	468
	All Aircraft	1910	1692

[1] CV-22 sorties on SR-101 are not planned.

2.1.3.2 Targets and Ranges

Readiness operations of the CV-22 Osprey would include the use of Eglin AFB ranges. Eglin AFB range locations are shown in Figure 2-4. The CV-22 aircraft, some time in the future, would be equipped with a single, multi-barreled gun for firing tracers and bullets. In addition, it is anticipated that the CV-22 would use chaff and magnesium flares. There is no intention for the CV-22 to carry bombs or missiles. Use of ordnance would occur within the ranges contained at Eglin AFB. Test area A-77 (Eglin AFB Range R-2915A) is the most heavily used Eglin

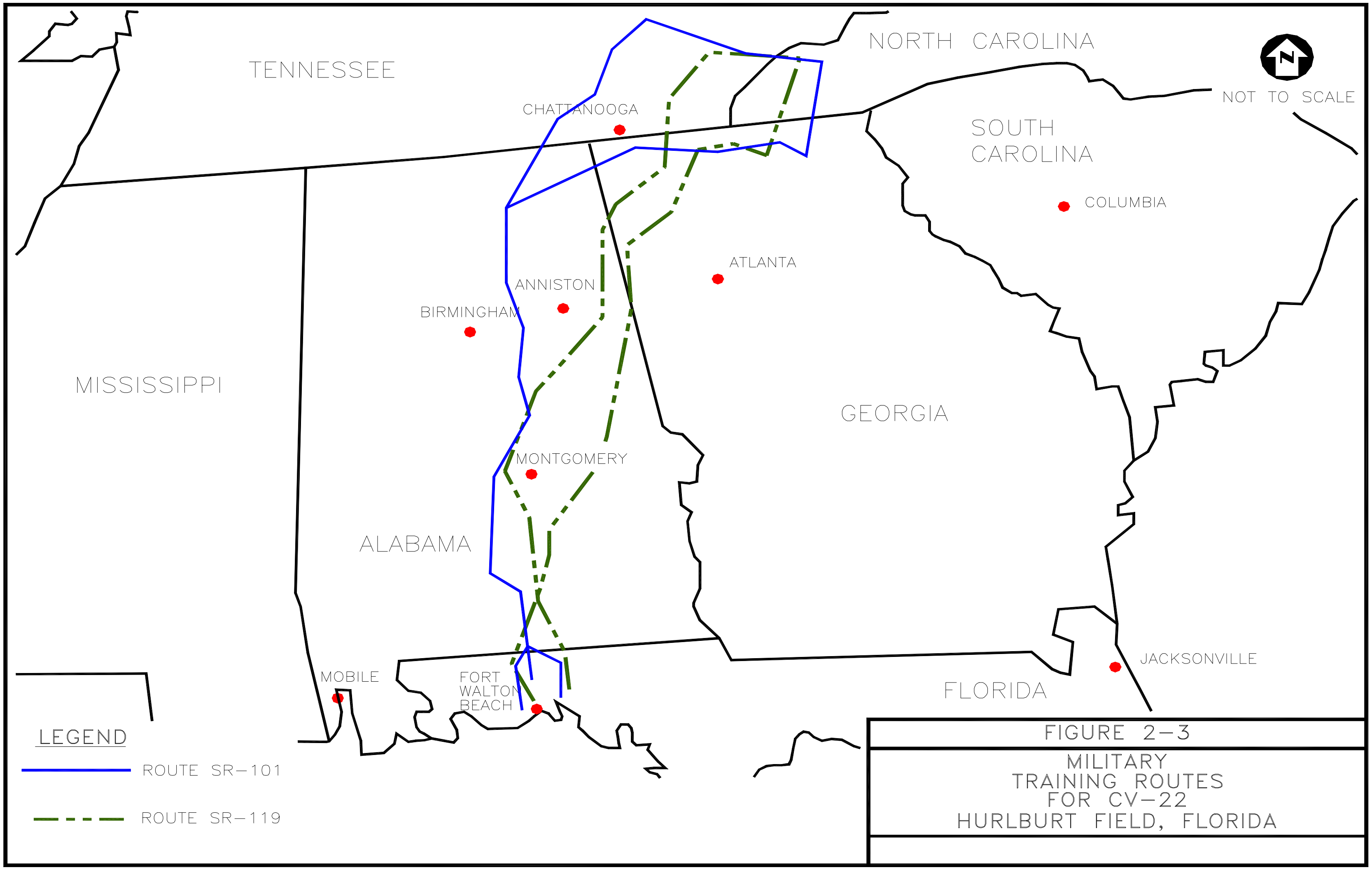


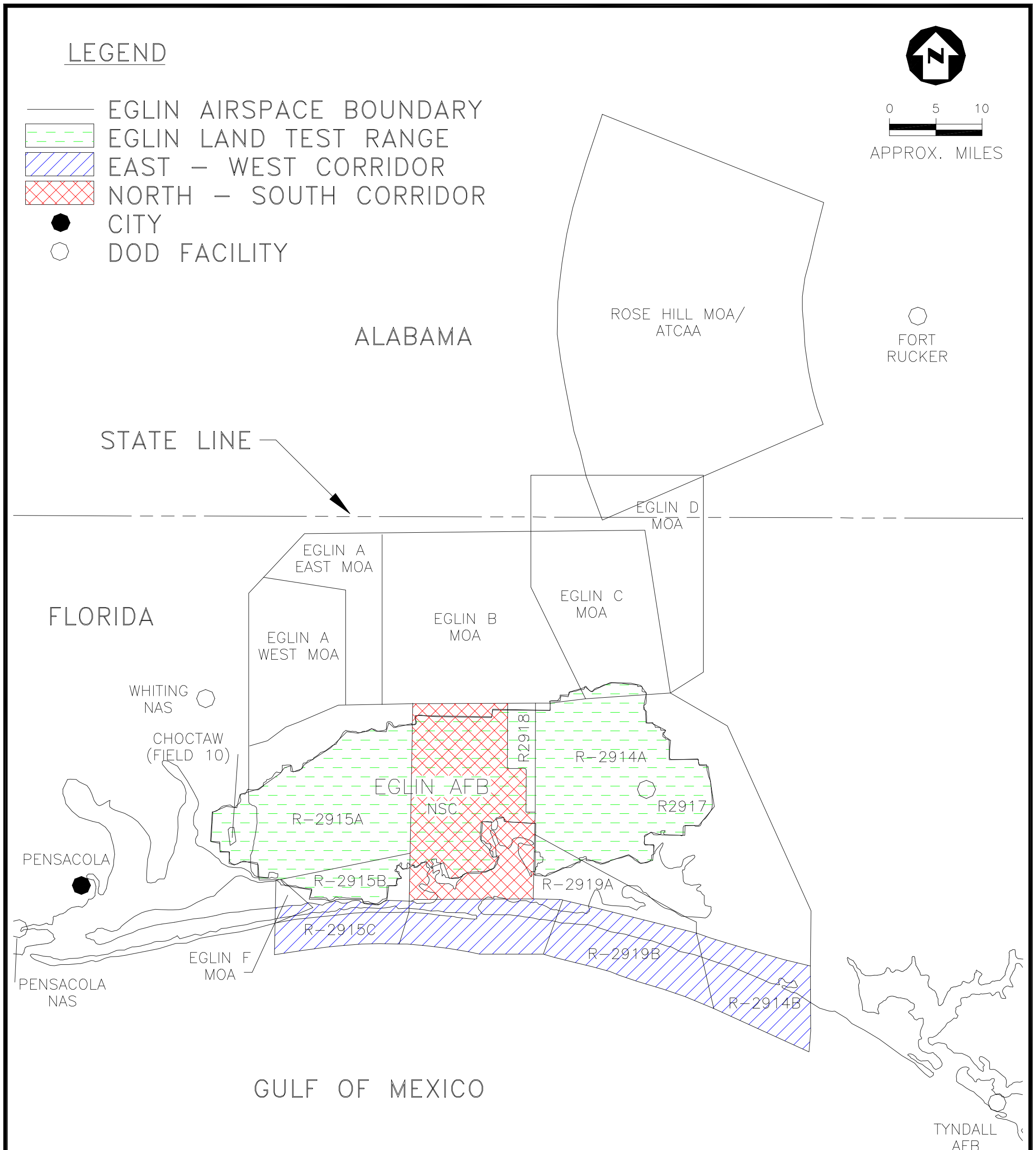
FIGURE 2-3

MILITARY
TRAINING ROUTES
FOR CV-22
HURLBURT FIELD, FLORIDA

AFB location for the conduct of air-to-ground, live fire training by Hurlburt-based units. During FY99, approximately 1228 sorties were flown by MH-53 helicopters over Eglin AFB ranges. Prior to their retirement, an additional 899 sorties were flown by MH-60 helicopters over Eglin AFB ranges on an annual basis. The use of Eglin AFB ranges would continue following CV-22 deployment. Table 2.1-2 provides a summary of current range use and range use projections following CV-22 deployment. Projected range use in FY12, following CV-22 beddown, would increase by approximately 17 percent over the baseline FY99 condition.

Table 2.1-2: Current and Projected Use of Eglin AFB Ranges by MH-53, MH-60, and CV-22 Helicopters

Range	Number of Sorties Baseline (FY99)			Number of Sorties - FY12 Projected	
	MH-53	MH-60	CV-22	MH-53	CV-22
R-2914A	36	60	0	0	96
R-2919A	21	35	0	0	56
R-2915A	511	439	0	0	840
R-2915B	477	365	0	0	840
R-2915C	6	0	0	0	60
TAB 6	0	0	0	0	420
A-77	85	0	0	0	60
A-78	85	0	0	0	60
C-52N	7	0	0	0	60
Range Totals	**2127**			**2492**	



MOA – MILITARY OPERATIONS AREA
ATCA – AIR TRAFFIC CONTROL ASSIGNED AIRSPACE

NOTES:

EGLIN E MOA OVERLIES ALL RESTRICTED AREAS (R).

EAST – WEST CORRIDOR (EWC) UNDERLIES: R–2915C, R–2919B, R–2914B, SOUTHERN HALF OF NORTH – SOUTH CORRIDOR (NSC), FROM THE SURFACE TO 8,500 FEET MSL.

THAT PORTION OF EGLIN E MOA ABOVE THE NSC FROM FL 180 TO FL 600, AND THE AIRSPACE ABOVE ROSE HILL MOA BETWEEN FL 180 AND FL 230 ARE ALSO ATCAAs.

SOURCE: U.S. GOVERNMENT FLIGHT INFORMATION PUBLICATION, 1995a.

FIGURE 2–4

RANGE LOCATIONS
EGLIN AFB

Hurlburt Field Environmental Assessment

2.1.3.3 Maintenance Activities

The CV-22 would have a three-level maintenance program for USSOCOM: organizational, intermediate, and depot. Organizational maintenance tasks include all inspections, repairs, servicing, removal and replacement of faulty systems, and checkouts performed on the aircraft. The workforce would include the Helicopter Crew Chief and specialists in the fields of Integrated Avionics, Propulsion, Hydraulics, and Electro-Environmental maintenance. The majority of the scheduled and unscheduled maintenance would be preformed at this level. Depot level maintenance requires highly specialized skills, sophisticated equipment, and special facilities; for example, the major overhaul or replacement of critical components or the repair of a crash damaged aircraft. (USAF, 1999b).

Because existing maintenance facilities would require little or no alteration to accommodate the CV-22, only minimal change to existing maintenance activities would be required to meet CV-22 beddown requirements.

2.1.4 Personnel

The total number of support personnel required for the CV-22 Osprey beddown at Hurlburt Field would increase from 174 personnel in FY03 to a maximum of 1791 in FY12. The workforce required to support MH-53 and MH-60 activities during the FY99 baseline year totaled 1897 personnel; therefore, the helicopter/tiltrotor manpower requirements would decrease by approximately 6 percent between FY99 and FY12. Table 2.1-3 shows the distribution of operations, maintenance, and overhead personnel required to support aircraft operations at Hurlburt Field during the period of FY99 through FY12. In addition to the ground support personnel, 50 aircrews consisting of two pilots and two engineers for each aircraft would be stationed at Hurlburt Field for CV-22 training. Aircrews would rotate into and out of Hurlburt Field upon completion of their training, similar to the existing MH-53 operations.

Table 2.1-3: Manpower Requirements to Support Hurlburt Field Aircraft Operations, FY99 through FY12.								
Manpower Requirement	**Aircraft Type**	**FY99**	**FY00**	**FY03**	**FY06**	**FY09**	**FY12**	**Percent Change**
Operations	MH-53	174	174	144	90	0	0	
	MH-60	32	0	0	0	0	0	
	CV-22	0	0	8	56	104	192	
	MC-130	305	230	251	258	258	258	
	Total	**511**	**404**	**403**	**404**	**362**	**450**	**-8.8**
Maintenance	MH-53	693	693	510	315	0	0	
	MH-60	93	0	0	0	0	0	
	CV-22	0	0	30	214	396	729	
	MC-130	971	788	812	817	816	816	
	Total	**1757**	**1481**	**1352**	**1346**	**1212**	**1545**	**-8.8**
Overhead	MH-53	26	24	24	24	0	0	
	MH-60	15	0	0	0	0	0	
	CV-22	0	0	0	22	44	66	
	MC-130	58	53	56	56	56	56	
	Total	**99**	**77**	**80**	**102**	**100**	**122**	**+8.1**
Total	**All**	**2367**	**1962**	**1835**	**1852**	**1674**	**2117**	**-8.9**

2.2 No Action Alternative

Under the No Action Alternative the beddown of the CV-22 Osprey would not occur at Hurlburt Field. The USAF and 16 SOW would not have access to the enhanced capabilities of the CV-22 Osprey; therefore, the ability to quickly insert assault forces or extract military personnel and American citizens with a greater degree of operational effectiveness and safety would be reduced. Selection of the No Action Alternative would result in the continued use of the MH-53 helicopters by the 16 SOW and the USAF.

Under the No Action Alternative, all airfield, airspace, and range use would be the same as the baseline conditions. Pilots and maintenance personnel would continue to be trained at Hurlburt Field; however, as the MH-53's continue to age, maintenance of the helicopters would become more costly, and increased maintenance training would be required. Rotor and fixed wing operations would continue at a rate similar to current levels at Hurlburt Field. Operations along the

MTRs and use of targets and range at Eglin AFB and within restricted areas would continue at approximately current levels. Thus, the impacts of the No Action Alternative are a continuation of existing conditions, as described in Section 3.0 of this EA.

2.3 Identification of Alternatives Eliminated From Further Consideration

Initially two options were considered for beddown and operation of three 16 SOW squadrons utilizing the CV-22 Osprey:

- Beddown of three special operations squadrons at Hurlburt Field, and
- Beddown of two squadrons at Hurlburt Field and the beddown of one squadron at Eglin AFB, located 11 miles east of Hurlburt Field.

However, difficulties were encountered when trying to locate a suitable site to house the CV-22 at Eglin AFB that did not involve substantial conflict with existing missions or would not have required construction of new facilities and associated infrastructure. The required construction would have included both training and hangar facilities, as well as runway modifications. In addition, space limitations adjacent to the flightline at Eglin AFB would necessitate that some of the construction be performed in wetlands or other environmentally sensitive areas. Consequently, the option of locating one of the three special operations squadrons at Eglin AFB was dropped from further consideration.

2.4 Identification of the Preferred Alternative

The Agency preferred alternative is the Proposed Action.

2.5 Comparison of the Environmental Impacts of All Alternatives

Table 2.5-1 compares the environmental effects of the Proposed Action and the No Action Alternative.

Table 2.5-1 Comparison of Environmental Consequences

Environmental Resource Areas	Proposed Action	No Action Alternative
Air Quality	Short-term – Minor Adverse	Short-term –No Impacts
	Long-term – No Impacts	Long-term - No Impacts
Airspace	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Noise	Short-term – No Impacts	Short-term – No Impacts
	Long-term – Minor Beneficial	Long-term – No Impacts
Wastes, Hazardous Materials, Stored Fuel	Short-term – Minor Adverse	Short-term – No Impacts
	Long-term – Beneficial	Long-term – No Impacts
Water Resources	Short-term - Minor Adverse	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Biological Resources	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Geology and Soils	Short-term – Minor Adverse	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Cultural Resources	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Land Use	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Environmental Justice	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts
Indirect and Cumulative Impacts	Short-term – No Impacts	Short-term – No Impacts
	Long-term – No Impacts	Long-term – No Impacts

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SECTION 3.0
AFFECTED ENVIRONMENT

This section presents information on environmental conditions for resources potentially affected by the Proposed Action and the Alternative Action described in Section 2.0. Under NEPA, the analysis of environmental conditions should address only those areas and environmental resources with the potential to be affected by the Proposed Action or alternatives; locations and resources with no potential to be affected need not be analyzed. The environment includes all areas and lands that might be affected, as well as the cultural and natural resources they contain or support. For the analyses in this EA, baseline conditions represent the status of Hurlburt Field in 1999. This section establishes the basis for assessing impacts of the alternatives on the affected environment provided in Section 4.0.

3.1 PHYSICAL AND DEMOGRAPHIC SETTING

3.1.1 Hurlburt Field

Hurlburt Field is located on 6,634 acres near the city of Mary Esther, approximately 5 miles west of the city of Fort Walton Beach in the Florida panhandle. It is located wholly within the boundaries of the Eglin AFB Reservation.

Hurlburt Field is home to the Air Force Special Operations Command (AFSOC) and the 16th Special Operations Wing (SOW). Since 1997, the 16 SOW has been reduced from eight squadrons to six. The MC-130E Combat Talon I aircraft of the 8th Special Operations Squadron (SOS) were moved to Duke Field in February of 1999, and the MH-60G Pave Hawk helicopters of the 55th SOS moved to Moody AFB in November of the same year. Operations for these two squadrons were included in this analysis for the part of the year they operated at

Hurlburt Field. For baseline conditions represented by Calendar Year (CY) 1999, the six remaining units are: the 16 SOS flying the AC-130H Spectre Gunship aircraft; the 4 SOS flying the AC-130U Spooky Gunship aircraft; the 15 SOS flying the MC-130H Combat Talon II aircraft; the 6 SOS flying the C-130E and CASA 212 aircraft and UH-1N helicopter; the 20 SOS flying MH-53J Pave Low III/IV helicopter; and the 19 SOS training unit that shares 16 SOW-assigned aircraft (USAF, 2000i).

Hurlburt Field currently consists of one runway and two helicopter landing pads: Runway 18/36 is 9,600 feet long and 150 feet wide while helicopter landing pads Charlie (CP) and Delta (DP) are both 200 feet long and 200 feet wide. The average field elevation is 38 feet above MSL, and the current magnetic declination is 1.3 degrees west (DoD, 2000).

Aircraft flight activity at Hurlburt Field consists of fixed-wing and rotary-wing arrivals, departures, and pattern operations. Flight operations are a mix of fixed-wing and rotary-wing aircraft operations with AC-130Us and MH-53Js dominating in the absence of MH-60Gs. The 16th Aircraft Generation Squadron, the 16th Component Repair Squadron, the 16th Equipment Maintenance Squadron and the 16th Helicopter Generation Squadron perform aircraft related maintenance activities at Hurlburt Field. These include fixed-wing and rotary-wing maintenance run-up operations (USAF, 2000i).

3.1.2 Military Training Areas

The training of aircrew members in new weapon systems and tactics requires the use of specially designated airspace in order to achieve and maintain combat-ready status. Training occurs in airspace beyond the bounds of the host airfield, but generally within 150 NM. The airspace complex, as defined for the purposes of this analysis, consists of one baseline Slow Route (SR), four Restricted Areas (including three Target Areas), and one Landing Zone within the Eglin Range Complex as shown in Table 3.1-1.

Table 3.1-1.
Modeled Airspace Components within Eglin Range Complex

Military Training Route
SR-119
Restricted Areas/Target Areas
R-2915A
R-2915B
R-2914A
R-2919A
A-77
A-78
C-52N
Landing Zone
Army Ranger Camp (TAB 6)

Slow Route 119 (SR-119) overlies several southeastern states, including Florida, Alabama, Tennessee, North Carolina and Georgia as shown in Figure 2-3. The use of SR-119 is currently limited to C-130 aircraft operations.

The Restricted Areas are airspace components of the Eglin Range Complex including R-2915A, R-2915B, R-2914A and R-2919A located in the western panhandle of the state of Florida. R-2915A contains Target Areas A-77, A-78 and Landing Zone Tab 6, also known as Army Ranger Camp. These Target Areas are used for initial or proficiency training of crews in air-to-surface ordinance deliveries. R-2914A includes Target Area C-52N.

3.2 ENVIRONMENTAL SETTING

3.2.1 Airfield and Airspace Operations

The purpose of this section is to describe the baseline conditions as represented by CY99 flight operations at Hurlburt Field and certain airspace components within the Eglin Range Complex. The 1997 Air Installation Compatible Use Zone

(AICUZ) conditions were reviewed and updated for CY99 (USAF, 1998c). Sections 3.2.1.1 and 3.2.1.2 discuss baseline airfield and airspace operations.

3.2.1.1 Airfield Operations

Section 3.2.1.1.a. discusses the modeled annual flight operations by aircraft type and operation type. Section 3.2.1.1.b. discusses runway, flight track utilization, and run-up operations by aircraft type.

3.2.1.1.a. Flight Operations

For CY99, approximately 78,401 flight operations were conducted at Hurlburt Field. Approximately 90 percent (70,818 operations) of these operations were conducted by based aircraft. Transient aircraft represent just under 10 percent of the flight operations. In addition, 20 percent of all based aircraft operations occurred between 2200 and 0700 local time. About 64 percent of all based aircraft operations were rotary-wing operations conducted by MH-60G Pave Hawk, MH-53J Pave Low III/IV and UH-1N aircraft. An operation is described as either a departure (takeoff) or an arrival (landing) or a pattern which consists of Touch & Go, Ground Controlled Approach (GCA), Teardrop pattern and Functional Check Flight (FCF) operations. Patterns consist of a departure followed by a flight track within the airfield vicinity, then an arrival. Table 3.2-1 shows the total flight operations at Hurlburt Field for CY99.

3.2.1.1.b. Runway, Flight Track Utilization, and Run-up Operations

Runway utilization percentages for all aircraft, as provided by Hurlburt Field personnel for CY99, are presented in Table 3.2-2.

Table 3.2.1
CY99 Total Flight Operations at Hurlburt Field

Airfield Totals	Departures			Arrivals			Touch & Go [1]			GCA Box [1]			Teardrops(18-36) [1]			Grand Total		
	0700-2200	2200-0700	TOTAL	0700-2200	2200-0700	TOTAL	0700-2200	2200-0700	TOTAL	0700-2200	2200-0700	TOTAL	0700-2200	2200-0700	TOTAL	0700-2200	2200-0700	TOTAL
BASED AIRCRAFT	5286	1627	6913	2790	4123	6913	40090	2484	42574	7052	6132	13184	1194	40	1234	56412	14406	70818
TRANSIENT AIRCRAFT	605	27	632	589	44	633	5594	340	5934	384		384				7172	411	7583
AIRFIELD TOTALS	5891	1654	7545	3379	4167	7546	45684	2824	48508	7436	6132	13568	1194	40	1234	63584	14817	78401

[1] Counted as two operations

Table 3.2-2
CY99 Runway/Pad Utilization Percentages at Hurlburt Field

Operation Type	Runway/ Pad	Runway/Pad Utilization									
		AC-130H	AC-130U	C-12	MC-130P	UH-1N	MH-53J	C-130E	MH-60G	MC-130E	Transient
Departure/ Arrival	18	50%	50%	34%	22%			32%		22%	30%
	36	50%	50%	66%	78%			68%		78%	70%
	8CP[2]					59%					
	6CP[2]					41%					
	6DP[2]						67%		52%		
	8DP[2]						33%		48%		
Touch & Go	18	50%	50%	34%	22%	41%	42%	32%	48%	22%	30%
	36	50%	50%	66%	78%	59%	42%	68%	49%	78%	70%
	8CP[2]										
	6CP[2]										
	8DP[2]						16%		3%		
	6DP[2]										
FCF[1]	8DP[3]						100%		100%		
	6DP[2]										
GCA	18	50%	50%	34%	22%			32%		22%	30%
	36	50%	50%	66%	78%			68%		78%	70%
Tear Drop	18	50%	50%	34%	22%			32%		22%	
	36	50%	50%	66%	78%			68%		78%	

[1] Bridge to Bridge Pattern by MH53Js & MH60Gs.
[2] 8" is heading 180 degrees, "6" heading 360 degrees, "CP" is Charlie Pad, "DP" is Delta Pad.

Runway 18/36 has primarily a northerly flow of traffic for departures and arrivals. Usage of Runway 36 accounts for nearly 60 percent of the overall fixed-wing operational use of the field. Large rotary-wing (MH-53J, MH-60G) operations are generally assigned to helicopter landing pad Delta while all other rotary-wing traffic use helicopter landing pad Charlie. About 56 percent of all rotary-wing traffic operate in a northerly flow.

Each departure and arrival flight track description has its own unique corresponding flight track description and identification.

The other operational flight tracks include two Touch & Go patterns, one GCA pattern, one Teardrop Pattern (departing Runway 18 and arriving on Runway 36 after a teardrop maneuver) and two FCF patterns (either Navarre Bridge to Brooks Bridge or vice versa, then back to the field). Each of these categories of tracks has only one flight track per operation per runway except for Touch & Go operations. Hurlburt Field has a total of 175 daily events, with events described as an occurrence of one of the above four operational flight tracks or an arrival or departure.

A flight profile consists of aircraft power settings, altitudes AGL, and airspeeds along each flight track. Preflight run-up operations at Hurlburt Field are usually of a duration of 5 to 15 seconds. Maintenance run-ups can last from 1 minute to 1.5 hours (USAF, 1998c)

3.2.1.2 Airspace Operations

Sections 3.2.1.2a and 3.2.1.2b. discuss CY99 operations associated with the MTRs and restricted areas, ranges and landing zones. Further airspace discussions are presented in Appendix G.

3.2.1.2.a. Military Training Route

A wide variety of Department of Defense aircraft (Navy, Marine, Air Force, Army; National Guard, Reserve, and active duty) use MTRs for training purposes. SR-119 is located within the boundaries of the southeastern states of Florida, Alabama, Tennessee, Georgia and North Carolina. Headquarters (HQ) AFSOC Directorate of Training (DOT) personnel provided utilization data for SR-119. Table 3.2-3 contains the number of CY99 daytime and nighttime sorties for SR-119. Not all 30 days of a month are typically utilized; therefore, the modeling period was 26 days per busy month. In addition, because MTR sorties may be conducted over a range of altitudes (depending on the type of aircraft and training mission), the table indicates the typical altitude distribution for each aircraft on the route.

Table 3.2-3.
CY99 Sorties and Flight Profiles for SR-119

Aircraft Type	Day Sorties (0700-2200)	Night Sorties (2200-0700)	Total Sorties	Modeled		Typical Altitude Distribution (feet, Above Ground Level) Percent of Time between
				Power Setting	Indicated Airspeed (KIAS)	250-1000
MC-130E	50	350	400	850 C TIT	210	100%
MC-130H	30	250	280	850 C TIT	210	100%

3.2.1.2.b. Restricted Areas, Ranges and Landing Zones

A variety of DoD aircraft conduct training operations at the Restricted Areas and Target Areas at Eglin AFB. R-2915A lies north of Hurlburt Field to Interstate 10 and laterally from west of Eglin AFB to the east of the Pensacola Regional Airport. Army Ranger Camp landing zone and Test Areas A-77 and A-78 lie under R-2915A. A-77 and A-78 have several targets used for strafing, rocket firings, and simulated nuclear and conventional bombing scattered through them.

The Army Ranger Camp consists of one runway 8000 feet long and 200 feet wide. The Army Ranger Camp also includes Field 6 Assault Strip and three Drop Zones: Sontay, Khafji, and Hob Knob (USAF, 1998d).

R-2915B is located directly south of R-2915A and extends southward to the Santa Rosa Island. The lateral boundaries of R-2915B start west of the town of Fort Walton Beach and continue west to Navarre Bridge. Hurlburt Field and part of Hurlburt Field Class D airspace lie underneath R-2915B.

R-2914A is the largest of all the airspace units analyzed. It is located east of Eglin AFB and eastward to DeFuniak Springs and Panama City Beach. Its boundaries are Interstate 10 to the north and across the Choctawhatchee Bay to the south. R-2917 is a circular restricted area located within the bounds of R-2914A. Test Area C-52N is also located within the boundaries of R-2914A and is used for strafing, rocket firings, and conventional bombing.

R-2919A is located directly south of R-2914A in the Choctawhatchee Bay and north of Route 98.

AFCEE provided annual aircraft sorties, hours of utilization, airspeed and power profiles for all airspace operations. This information is shown in Table 3.2-4. Due to the lack of information on their engine and airframe noise characteristics, experimental aircraft referred to as X1, G1, and ABC1 could not be positively identified for the needs of this analysis. In order to produce conservative estimates, these aircraft were modeled as an F-15E, the dominant aircraft operating in R-2915A.

Recognizing that aircraft typically do not utilize the airspace components every day during the month, a modeling period of 22 days was implemented.

Table 3.2-4
CY99 Modeled Restricted Area, Target Areas and Landing Zone Sorties

Restricted Areas/Target Areas/Landing Zone	Aircraft Type	Annual Sorties			Flight Profile			Altitude Distribution (ft AGL)	
		Day (0700-2200)	Night (2200-0700)	Total	Typical/Average Power Setting	Indicated Airspeed (knots)	Average Mission Duration (Hours)	0-3000	3000-25000
R-2915A	C130	726	258	983	850 C TIT	210	3.0	35%	65%
	F15	456.5	11.5	468	77%NC	450	0.8	30%	70%
	MH-60	336.5	102.5	439	120 Knots	120	2.5	90%	10%
	MH-53	360.5	64.5	425	68% Q-BPA	120	2.5	90%	10%
	F16	246.25	2.75	249	94%NC	465	0.8	30%	70%
	UH-1	113	5	118	100 Knots	80	2.0	80%	20%
	F15E	75.5	0.5	76	77%NC	450	0.9	30%	70%
	A10	53		53	5333 NF	325	2.0	50%	50%
	KC135	46.25	4.75	51	89.6% NC	300	0.5		100%
	CH47	33	15	48	120 Knots	120	2.5	80%	20%
	MC130	30.25	8.75	39	850 C TIT	210	2.0	60%	40%
	F18	30		30	88% NC	400	0.8	30%	70%
	X1 [1]	17		17	77%NC	450	0.5	100%	
	AH1	15	1	16	100 Knots	80	2.5	90%	10%
	G1 [1]	10.75	0.25	11	77%NC	450	0.5		100%
	CV22	11		11	0^0 Nacelle	220	2.0	70%	30%
	B1	11		11	89.9% RPM	360	2.0	40%	60%
	C141	8.5	1.5	10	85% NF	300	3.0	30%	70%
R-2915B	MH-53	316	76	392	68% Q-BPA	120	2.5	90%	10%
	C130	289.5	98.5	388	850 C TIT	210	3.0	35%	65%
	MH-60	274.5	90.5	365	120 Knots	120	2.5	90%	10%
	F16	104.75	1.25	106	94%NC	465	0.8	30%	70%
	UH-1	73.75	3.25	77	100 Knots	80	2.0	80%	20%
	MC130	47.75	16.25	64	850 C TIT	210	2.0	60%	40%
	F15	56.5	1.5	58	77%NC	450	0.8	30%	70%
	F15E	29.75	0.25	30	77%NC	450	0.9	30%	70%
	KC135	27.25	2.75	30	89.6% NC	300	0.5		100%
	AH1	15	1	16	100 Knots	80	2.5	100%	
	A10	13		13	5333 NF	325	2.0	50%	50%
	X1 [1]	11		11	77%NC	450	0.5	100%	
	CH47	7.25	3.75	11	120 Knots	120	2.5	80%	20%
	B1	11		11	89.9 % RPM	360	2.0	40%	60%
R-2914A	F15	422	11	432	77%NC	450	0.8	30%	70%
	C130	278.5	66.5	345	850 C TIT	210	3.0	35%	65%
	F16	325.25	3.75	329	94%NC	465	0.8	30%	70%
	UH-1	102.5	4.5	107	100 Knots	80	2.0	80%	20%
	A10	97		97	5333 NF	325	2.0	50%	50%
	MH-60	48.5	11.5	60	120 Knots	120	2.5	90%	10%
	F15E	43.75	0.25	44	77%NC	450	0.9	30%	70%
	ABC1[1]	37.25	0.75	38	77%NC	450	1.0	100%	
	MH-53	30.75	5.25	36	68% Q-BPA	120	2.5	90%	10%

Table 3.2-4 **(Continued)**

CY 99 Modeled Restricted Area, Target Areas and Landing Zone Sorties

Restricted Areas/Target Areas/Landing Zone	Aircraft Type	Annual Sorties			Flight Profile			Altitude Distribution (ft AGL)	
		Day (0700-2200)	Night (2200-0700)	Total	Typical/Average Power Setting	Indicated Airspeed (knots)	Average Mission Duration (Hours)	0-3000	3000-25000
	KC135	29	3	32	89.6% NC	300	0.5		100%
	MC130	20.75	5.25	26	850 C TIT	210	2.5	60%	40%
	AH64	19.75	6.25	26	100 Knot	100	2.5	90%	10%
	C130E	21		21	850 C TIT	210	3.0	20%	80%
	C141	14.25	2.75	17	85% NF	300	3.0	30%	70%
	F18	12		12	88% NC	400	0.8	20%	80%
	HH60	5.25	5.75	11	120 Knots	120	2.0	90%	10%
R-2919A	F16	175	2	177	94%NC	465	0.8	30%	70%
	C130	126.5	42.5	169	850 C TIT	210	3.0	35%	65%
	F15	54.75	1.25	56	77%NC	450	0.8	30%	70%
	MH-60	27.5	7.5	35	120 Knots	120	2.5	90%	10%
	F15E	32.75	0.25	33	77%NC	450	0.9	30%	70%
	KC135	21.75	2.25	24	89.6% NC	300	0.5		100%
	MC130	17	5	22	850 C TIT	210	2.5	60%	40%
	MH-53	18.25	2.75	21	68% Q-BPA	120	2.5	90%	10%
	A10	17		17	5333 NF	325	2.0	50%	50%
	C141	12.5	2.5	15	85% NF	300	3.0	30%	70%
	ABC1 1	13.75	0.25	14	77%NC	450	1.0	100%	
	F18	12		12	88% NC	400	0.8	20%	80%
A-77	C-130	254	48	302	850 C TIT	210	3	35%	65%
	MH-53M	72	13	85	68% Q-BPA	120	2.5	90%	10%
A-78	C-130	253.92	48.47	302.39	850 C TIT	210	3	35%	65%
	MH-53M	72.1	12.9	85	68% Q-BPA	120	2.5	90%	10%
C-52N	MH-53M	6.15	1.05	7.2	68% Q-BPA	120	2.5	90%	10%
Army Ranger Camp	C-130	700	100	800	850 C TIT	210	0.75	(A-B) (0-100), (B-C,A-D, A-F, B-E) (100-300), (E-F,C-D) (300-500)	
Total		7251	1186	8437					

1 Experimental aircraft modeled as F-15E

3.2.2 Regional Meteorology

Hurlburt Field is located in an area that is subject to warm, subtropical weather that lasts almost nine months out of the year. The climate in the local area may be considered semi-tropical, being dominated by maritime tropical air during the summer and continental polar during the winter. Summer and winter are the two major seasons characterizing the climate at Hurlburt Field. Summer occurs from June through September and is characterized by high humidity and frequent convective thunderstorms. Winter occurs from September through March and is characterized by prevailing westerly winds with fairly frequent frontal passages or periods influenced by semi-stationary frontal zones (USAF, 1996c).

The Gulf of Mexico moderates the climate at Hurlburt Field by tempering the cold fronts during winter and causing cool sea breezes during summer. The average annual temperature is 68 degrees Fahrenheit (°F). The average temperature in summer is approximately 81°F, and winter temperatures are in the low to mid-50s. Relative humidity typically ranges from 56 to 79 percent throughout the year (USAF, 2000g).

Rainfall at Hurlburt Field is usually well-distributed throughout the year, with an average annual rainfall of 61.5 inches. The rainy season occurs from July through September. July is typically the wettest month, with an average rainfall of 7.59 inches. Much of the rainfall in the summer months results from convective thunderstorms developing during the afternoons. The driest months are October and November. October is typically the driest month with an average rainfall of 3.44 inches. Winter rains are frequently lighter but may extend over longer periods than summer rains (USAF, 2000g).

Moderate sea breezes usually blow off the Gulf of Mexico in the summer. Serious destructive hurricanes occasionally are experienced in the vicinity of Hurlburt Field, but the loss of life is rare. The annual prevailing wind is predominantly from north-northwest to north-northeast with an average speed of 5 knots. The frequency of inversions in the Hurlburt Field area is moderate with increased occurrences during the winter months. Inversions below 500 feet in the panhandle area are reported 25 percent of the time during the summer and 35 percent of the time during the winter. The most unfavorable meteorological conditions for pollutant dispersal occur during the months of July and August when the winds are calmest and the average wind speeds are below 3-4 knots.

However, light coastal breezes aid in the dispersion of pollutants in the atmosphere (USAF, 2000g).

3.2.3 Air Quality

3.2.3.1 Air Pollutants and Regulations

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined not only by the types and quantities of atmospheric pollutants but also by surface topography, the size of the air basin, and by the prevailing meteorological conditions.

The Clean Air Act (CAA) of 1970 directed the United States Environmental Protection Agency (USEPA) to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). The USEPA established both primary and secondary NAAQS under the provisions of the CAA. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (i.e., soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS currently are established for six air pollutants (known as "criteria air pollutants") including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_X, measured as sulfur dioxide, SO_2), lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to

10 micrometers (PM_{10}) and 2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Only PM_{10} is regulated by the rule.

SO_2 in the atmosphere is converted to various conjugated sulfur compounds that form physically harmful vapors or micro droplets (e.g., sulfuric acid) when combined with particulate matter and water.

Although O_3 is considered one of the criteria air pollutants and is measurable in the atmosphere, it is considered a secondary pollutant since O_3 typically is not emitted directly from most emissions sources. O_3 is formed in the atmosphere by photochemical reactions involving previously emitted pollutants or ozone precursors; therefore, O_3 is not considered when calculating emissions. Ozone precursors consist primarily of nitrogen oxides (NO_X) and volatile organic compounds (VOCs) that are directly emitted from various emission sources. For this reason, an attempt is made to control O_3 through the control of NO_X and VOCs.

The CAA does not make the NAAQS directly enforceable; however, the CAA does require each state to promulgate a state implementation plan (SIP) that provides for implementation, maintenance, and enforcement of the NAAQS in each air quality control region (AQCR) in the state. The CAA also allows states to adopt air quality standards that are more stringent than the Federal standards. As promulgated in the Florida Administrative Code, Title 62, Chapter 204.240, the State of Florida has adopted each of the NAAQS as the Florida standards except for SO_2 as listed in Table 3.2-5.

Table 3.2-5 National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]	Florida Standards[a,b]
Carbon Monoxide	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	No standard No standard	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)
Lead	Quarterly	1.5 µg/m^3	1.5 µg/m^3	1.5 µg/m^3
Nitrogen Dioxide	Annual	0.0543 ppm (100 µ g/m^3)	0.0543 ppm (100 µg/m^3)	0.0543 ppm (100 µg/m^3)
Ozone	1 hour[e]	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)	0.12 ppm (235 µg/m^3)
PM_{10}	Annual 24-hour	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3
Sulfur Oxides (measured as SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 µg/m^3) 0.14 ppm (365 µg/m^3) No standard	No standard No standard 0.50 ppm (1,300 µg/m^3)	0.02 ppm (60 µg/m^3) 0.10 ppm (260 µg/m^3) 0.50 ppm (1300 µg/m^3)

PM_{10} Particles with aerodynamic diameters less than or equal to a nominal 10 micrometers

[a] The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

[b] The NAAQS and Florida standards are based on standard temperature and pressure of 25 degrees Celsius and 760 millimeters of mercury.

[c] National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the state implementation plan is approved by the USEPA.

[d] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the state implementation plan is approved by the USEPA.

3.2.3.2 Regional Air Quality

The USEPA classifies the air quality within an AQCR according to whether or not the concentration of criteria air pollutants in the atmosphere exceeds primary or secondary NAAQS. All areas within each AQCR are assigned a designation of either attainment, nonattainment, unclassifiable attainment, or not designated attainment for each criteria air pollutant. An attainment designation indicates that the air quality within an area is as good as or better than the NAAQS. Nonattainment indicates that air quality within a specific geographical area exceeds applicable NAAQS. Unclassifiable and not designated indicates that the air quality cannot be or has not been classified on the basis of available information as meeting or not meeting the NAAQS and is treated as attainment. Before a nonattainment area is eligible for reclassification to attainment status, the state must demonstrate compliance with NAAQS in the nonattainment area for three consecutive years and demonstrate, through extensive dispersion modeling, that attainment status can be maintained in the future even with community growth.

Generally, areas in violation of one or more of the NAAQS are designated nonattainment and must comply with stringent restrictions until all of the standards are met. In the case of O_3, CO, and PM_{10}, USEPA divides nonattainment areas into different categories, depending on the severity of the problem in each area. Each nonattainment category has a separate deadline for attainment and a different set of control requirements under the SIP.

Hurlburt Field is located in Okaloosa County within the Mobile-Pensacola-Panama City-Southern Florida Interstate AQCR 5. The AQCR covers a three-state region and includes the Alabama counties of Baldwin, Escambia, and Mobile; the Florida counties of Bay, Calhoun, Escambia, Gulf, Holmes, Jackson, Okaloosa, Santa Rosa, Walton, and Washington; and the Mississippi counties of Adams, Amite, Clairborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Green, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lamar, Lauderdale, Lawrence, Lincoln, Madison, Marion, Newton, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, and Wilkinson. The USEPA has designated the air quality within Okaloosa County as better than NAAQS for TSP, SO_2, and NO_2 and unclassified for CO, Pb, NO_2, O_3, and PM_{10}.

3.2.3.3 Baseline Air Emissions

An air emissions inventory is an estimate of total mass emissions of pollutants generated from a source or sources over a period of time, typically a year. The quantity of air pollutants is generally measured in pounds (lbs) per year or tons per year (tpy). Accurate air emissions inventories are needed for estimating the relationship between emissions sources and air quality. Emission sources may be categorized as either mobile or stationary emission sources. Typical mobile emission sources at Air Force installations include aircraft, on- and off-road vehicles, and aerospace ground equipment (AGE). Stationary emission sources may include boilers, generators, fueling operations, industrial processes, and burning activities, among others.

A complete mobile source emission inventory for Hurlburt Field has not been previously determined; therefore, the baseline emissions inventory quantities presented in Table 3.2-6 include the stationary emissions reported in the Hurlburt Field 1999 Air Emissions Inventory Report and mobile emissions estimated from 1999 airfield operations at Hurlburt Field. Emission quantities presented in Table 3.2-7 for the Mobile-Pensacola-Panama City-Southern Florida Interstate AQCR 5 only include significant stationary sources. Emission quantities from mobile sources (e.g., aircraft, automobiles, etc.) and insignificant or trivial stationary sources have not been determined for AQCR 5.

Table 3.2-6 Baseline Emissions Inventory, Hurlburt Field

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	SO_x (tpy)	NO_x (tpy)	PM10 (tpy)	Pb (tpy)
Based Aircraft[a]	51.01	26.26	5.30	80.04	4.46	0.00
Transient Aircraft[a]	24.00	13.78	1.39	20.10	2.09	0.00
Stationary Sources[b]	NA	65.90	NA	78.90	NA	NA
Total Emissions (tpy):	**75.01**	**105.94**	**6.69**	**179.04**	**6.55**	**0.00**

[a] Estimated from 1999 airfield operations at Hurlburt Field.

[b] Source: (Hurlburt Field Air Permit Number 0910064-004-AF).

tpy tons per year.

Table 3.2-7 Baseline Emissions Inventory, AQCR 5

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	SO_x (tpy)	NO_x (tpy)	PM10 (tpy)	Pb (tpy)
Current Emissions Total[a]	74,603	28,078	208,375	110,835	7,231	7

[a] Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).

tpy tons per year

3.2.4 Bird-Aircraft Strike Hazard

Bird-aircraft strikes constitute a safety concern because of the potential for damage to aircraft and injury to aircrews or local populations if an aircraft strike should occur in a populated area. Aircraft may encounter birds at altitudes of 30,000 feet MSL or higher; however, most birds fly close to the ground. More than 95 percent of reported bird strikes occur below 3,000 feet AGL. At Hurlburt Field most of the strikes occur below 2,000 feet AGL. Very few strikes happen in the airport environment, but occasionally a strike does occur involving a morning dove on the runway. Approximately 80 percent of the bird strikes occur during low altitude training at night to the north over Alabama, Georgia, and Tennessee.

The potential for bird-aircraft strikes is greatest in areas used as migration corridors (flyways), especially during the spring and fall migratory seasons or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands). At Hurlburt Field most strikes occur during the spring migration, from late March through May, and during the fall migration from late August to early November. Migratory waterfowl present the greatest threat because of their size and their propensity to migrate in large flocks, but raptors, shorebirds, gulls, herons, and songbirds also pose a hazard. Peak migration periods for raptors, especially eagles, are from October to mid-December and from mid-January to the beginning of March. In general, flights above 1,500 AGL would be above most migrating and wintering raptors. Songbirds are small birds, usually less than one pound, that navigate along major rivers, typically between 500 to 3,000 feet AGL during nocturnal migration periods.

The Bird Aircraft Strike Hazard (BASH) Plan 91-212 (USAF, 2000h) establishes an overall bird and wildlife control program for Hurlburt Field and is designed to minimize aircraft exposure to potentially hazardous bird/wildlife strikes. Hurlburt Field is located on the fringe of two major flyways; the Mississippi Flyway and the Atlantic Flyway. Also, there is evidence that many birds accumulate along the coast and move through the area both east-west and west-east, selecting the circum-gulf rather than the trans-gulf route.

White pelicans, white ibis, swallows, hawks, and herons use the circum-gulf route. Fall migration in Northwest Florida is dispersed over several months. Peak periods usually follow the passage of cold fronts in September and October. A second, smaller peak occurs in March and April. Most birds migrate at altitudes less than one mile above the ground. Land birds prefer migrating at 1,000-2,000 feet. Most Canada geese fly at approximately 2,000 feet; while shore birds and snow geese usually fly at 8,000-10,000 feet. A substantial hawk migration occurs in this area. Peak movements for these raptors occur 24-48 hours following the passage of a cold front. Peak times are 0900-1400. Peak density for night migrants occurs between 2200 and 2400 hours.

3.2.5 Noise

Section 3.2.5.1 is a general discussion of noise metrics. More detailed information on noise is contained in Appendix B of this document. Section 3.2.5.2 presents noise exposure under baseline conditions including MTRs, restricted areas and ranges. Section 3.2.5.3 discusses airspace.

3.2.5.1 Noise Metrics

Noise represents one of the most prominent environmental issues associated with aircraft operations. Although many other sources of noise are present in today's communities, aircraft noise is readily identifiable. An assessment of aircraft noise requires a general understanding of how sound is measured and how it affects people and the natural environment. Appendix B provides a detailed discussion of noise and its effects on people and the environment.

The noise environment around a military or civil airfield normally is described in terms of the time-average sound level generated by the aircraft operating at that facility. These operations consist of the flight activities conducted during an average day at airfields where operations generally adhere to a fixed schedule (most commercial airports) or during a typical "busy day" at airfields where operations vary from day to day or between weekdays and weekends (most military airfields). Operations generally include fixed- and rotary-wing arrivals and departures at the airfield, flight patterns in the general vicinity of the airfield, and aircraft engine "run-ups" associated with engine pre-flight and maintenance checks.

Individual, single noise events are described in terms of the Sound Exposure Level (SEL or L_{AE}), in units of decibels. SEL takes into account the amplitude of a sound and the length of time during which each event occurs. It provides a direct comparison of the relative intrusiveness among single noise events of different intensities and duration. Appendix B provides a more complete discussion of SEL.

The federal noise measure used for assessing aircraft noise exposures in communities in the vicinity of airfields/airports is the Day-Night Average Sound Level (DNL or L_{dn}), in units of the decibel (dB). DNL is an average sound level generated by all aviation-related operations during an average or busy 24-hour period, with sound levels of nighttime noise events emphasized by adding a 10-dB weighting. Nighttime is defined as the period from 2200 to 0700 the following morning. The 10-dB weighting accounts for the generally lower background sound levels and greater community sensitivity to noise during nighttime hours. DNL has been found to provide the best measure of long-term community reaction to transportation noises, especially aircraft noise.

The metrics used to describe the noise associated with airbase operations differ from that used for special-use airspace operations. Because military aircraft have a requirement for combat training over land and water at low altitudes and high speeds, the Federal Aviation Administration (FAA) has approved the establishment of Special Use Airspace areas, which allow aircraft to operate at speeds in excess of 250 knots at altitudes below 10,000 feet MSL. Military aircraft require the use of a modified noise metric to appropriately account for the "surprise" effect that occurs under these conditions. The SEL (and the DNL metric) is adjusted to account for this effect of the onset-rate of aircraft noise on humans. Onset-rate adjusted SEL is denoted SEL_r. The adjusted DNL is designated as Onset-Rate Adjusted Day-Night Average Sound Level (L_{dnr}).

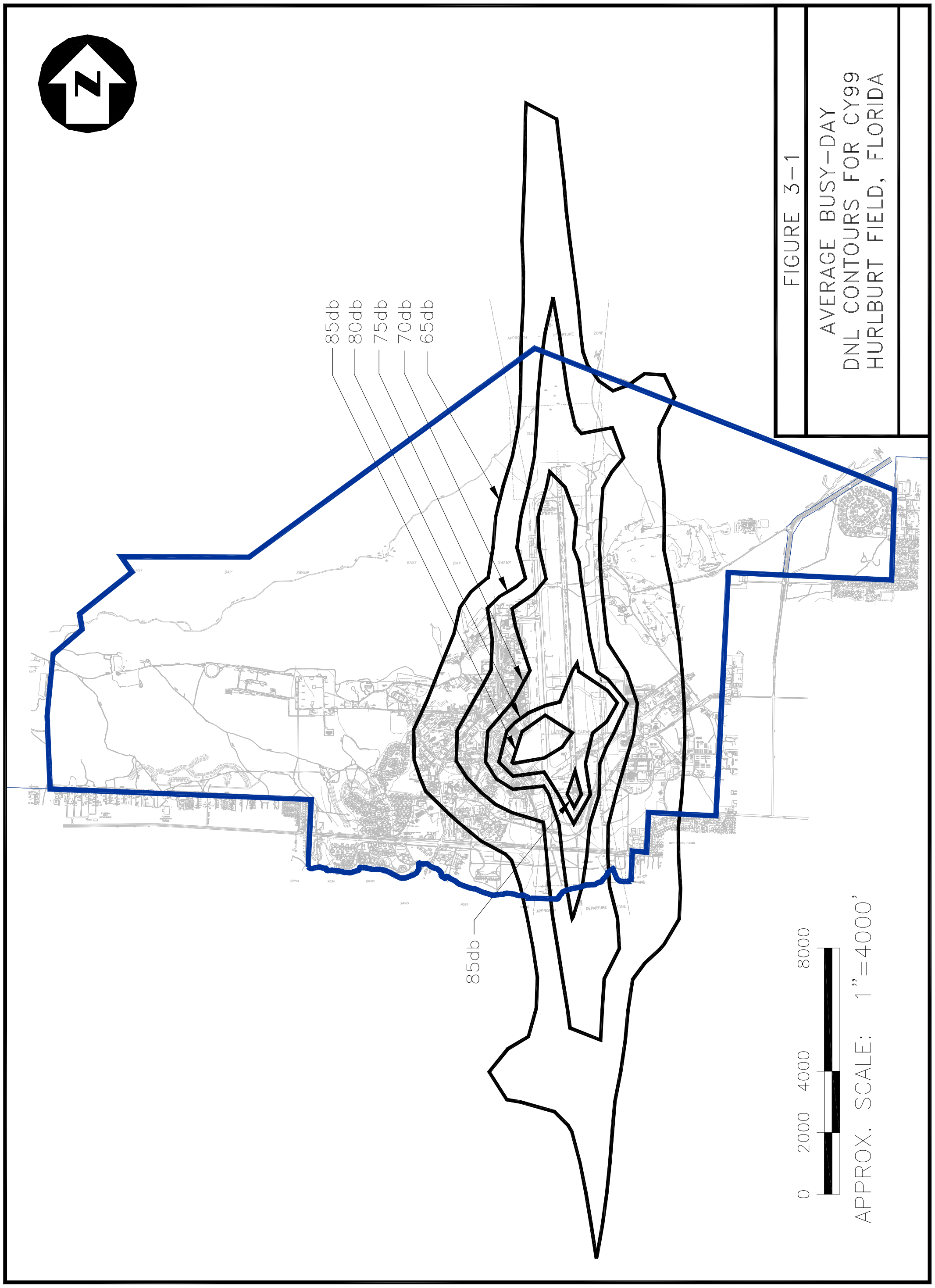
Another characteristic of military aircraft is that they operate in a sporadic fashion in designated low-altitude airspace. Sporadic occurrences may vary, from as frequently as tens of times per day in a range to less than a couple of times per year in a temporary MTR designed for exercises. Because of the sporadic occurrences of aircraft, the number of average daily operations is determined from the number of flying days in the calendar month with the highest number of operations in the affected airspace. This metric is designated Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}).

SEL, DNL, and L_{dnmr} employ A-weighted sound levels. "A-weighted" denotes the adjustment of the frequency content of a noise event to represent the way that the average human ear responds to the noise.

3.2.5.2 Noise Exposure Under Baseline Conditions

Using the data described in Sections 3.2.1.1, NOISEMAP 6.5 was used to calculate and plot the Day-Night Average Sound Level 65 dB through 85 dB contours for CY99 operations. Figure 3-1 shows the average busy day DNL contours for Hurlburt Field for CY99.

The CY99 DNL contours extend from the air station in the various directions of travel. However, except for lobes south of the runway, which extend over Santa Rosa Island into the Gulf of Mexico, and lobes southeast of the runway, which overlap into the city of Fort Walton Beach, the majority of the contours remain within the boundaries of Hurlburt Field and the Eglin Range Complex. The DNL 65-70 dB contour associated with CY99 operations is 4 percent larger (123 acres) than the DNL 65 dB contour contained in the 1997 AICUZ. Part of this increase occurred east of the field due to the 20 SOS MH-53 Pave Low III/IV helicopters conducting 250 night Touch & Go operations in 1999 versus none in 1997. The contours expanded west of Runway 18/36 due to an increase in AC-130H and AC-130U maximum power ground runs and the 180-degree change in the run-up direction from 154 degrees to 334 degrees. The northern and southern extents of the contours diminished slightly due to decreased C-5



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transient aircraft operations, the main contributor to the contours in those directions. To the northwest, there is also a reduction of the DNL 65-70 dB contour due to a modified profile of AC-130H and AC-130U aircraft flying above the airfield after departure. In the 1997 AICUZ, these aircraft were modeled flying above the airfield at 5,000 feet AGL versus 9,000 feet AGL in CY99. The DNL 70-75 dB contour for CY 1999 conditions was 6 percent smaller (95 acres) than the CY97 contour. This is due to decreased operations for the MC-130E and MH-60G during CY99 as compared to CY97. Contours of DNL 75 dB and above mostly are contained within the base boundary.

In the vicinity of Hurlburt Field, noise levels would be expected to increase to a DNL of 65 dB along aircraft flight paths west over the water to Navarre Bridge and northeast in the Eglin Range Complex to Crestview. These contours, however, remain over compatible land (water and the Eglin Range Complex) and are not shown in this analysis.

Table 3.2-8 shows the impacts of CY99 aircraft operations at Hurlburt Field in terms of estimated acreage, dwelling units and population within contours at 5 dB increments. No off-base population is estimated to be exposed to noise level greater than DNL 80 dB. The population data was obtained from the U.S. Census Bureau's 1990 census. More recent data is not expected to be available until after mid CY01. Census block-groups surrounding the airfield were extracted from the Topographically Integrated Geographic Encoding and Referencing (TIGER) files, while demographic data were extracted from the Summary Tape File (STF) 1A. Acres, dwelling units, and population calculated with U.S. Census data are estimates only and are most useful in determining relative change in impact between different noise contours. The computed contour areas exclude bodies of water and the area within Hurlburt Field itself.

Table 3.2-8
CY99 Estimated Off-Station Land Acres, Dwelling Units and Population within Noise Exposure Contours at Hurlburt Field

DNL Band	Item	Value
65-70 dB	Acres	519
	Dwelling Units	135
	Population	346
70-75dB	Acres	79
	Dwelling Units	24
	Population	68
75-80 dB	Acres	1.5
	Dwelling Units	8
	Population	23
80+ dB	Acres	0
	Dwelling Units	0
	Population	0

3.2.5.3 Airspace

For Military Training Routes, L_{dnmr} values were calculated using the MR_NMAP computer program for each segment A through X of SR-119. The noise levels, calculated directly under the MTR centerline, were all less than an average L_{dnmr} value of 50 dB.

Using the sortie data and the typical engine thrust settings, airspeeds, and altitude profiles, values of L_{dnmr} were calculated using the MR_NMAP computer program to simulate a uniform horizontal distribution of sorties within the Restricted Areas R-2915A, R-2915B, R-2914A and R-2919A and the Target Areas of A-77, A-78 and C-52N. This calculation represents an estimation of the baseline average noise exposure levels within each Restricted Area and Target Area. This estimation also holds true for noise levels of the analyzed aircraft only traversing the airspace in order to reach the Target Area. For example, having entered R-2915B, aircraft ingress and egress to a Target Area (A-77 or A-78) can occur from almost any point. Thus, random access is believed to correctly address the projected noise impacts. Each segment of the touch and go pattern at the Army Ranger Camp were analyzed using MR_NMAP. The highest values of average L_{dnmr} for each track are presented in Table 3.2-9.

Table 3.2-9
CY99 Maximum $L_{(dnmr)}$ within Restricted Areas, Target Areas and Landing Zones

Airspace Component	Average L_{dnmr} (dB) within Airspace
R-2915A	59
R-2915B	61
R-2914A	54
R-2919A	59
A-77	75
A-78	75
C-52N	<50
Army Ranger Camp - Runway Environment	56
Army Ranger Camp - Pattern Environment	<50

3.2.6 Wastes, Hazardous Materials, Stored Fuel, and Hazardous Waste Management

3.2.6.1 Wastes

There are two classifications of wastes generated at Hurlburt Field: nonhazardous solid waste and hazardous waste. Nonhazardous solid waste is removed by a contractor for off site disposal. Recyclables are also removed from the base by a contractor.

Hazardous wastes, as defined in the Resource Conservation and Recovery Act (RCRA) of 1976, are substances with strong physical properties of ignitability, corrosivity, reactivity, or toxicity that may cause an increase in mortality, a serious irreversible illness, an incapacitating reversible illness, or pose a substantial threat to human health or the environment. Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C.

Sections 9601-9675), the Toxic Substances Control Act (15 U.S.C. Sections 2601-2671), and the Solid Waste Disposal Act, as amended by RCRA (42 U.S.C. Sections 6901-6992). In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment when released into the environment. In addition, hazardous substances and hazardous chemicals are regulated by the Emergency Planning and Community Right to Know Act (EPCRA) (42 U.S.C. Sections 11001-11050). Transportation of hazardous materials is regulated by the U.S. Department of Transportation (DoT) regulations within 49 Code of Federal Regulation (CFR).

Normal operations at Hurlburt Field generate hazardous wastes as defined by the USEPA Implementing Regulations Identifying Hazardous Wastes (40 CFR 261). Hurlburt Field is considered a large-quantity hazardous waste generator as defined by RCRA (USAF, 2000d).

Hazardous wastes generated at Hurlburt Field include waste paint-related materials, waste oils, fuels, hydraulic fluid, adhesives, photo developers, and lubricants. The responsibility for managing hazardous waste lies with the generating organization and 16 CES/CEV. The waste is stored at or near the point of generation at initial hazardous waste accumulation points or special waste accumulation points, and is picked up at 90-day accumulation points by a contractor for off site disposal. There is a long-term storage facility, the Defense Reutilization and Marketing Office (DRMO), located in Building 525 at Eglin AFB that is utilized by Hurlburt Field for hazardous waste storage. The Eglin AFB DRMO serves as either a licensed hazardous waste storage facility or as an agent between Hurlburt Field and the hazardous waste facility and disposal facility (USAF, 1996b).

Emergency response to spills or releases of hazardous materials is governed by the requirements of CERCLA, EO 12580, and EPCRA. Under CERCLA, the resident agencies at Hurlburt Field and contractors are responsible for reporting releases of reportable quantities to the National Response Center within 24 hours.

Used oil is accumulated at sites around the base and periodically picked up by an outside contractor for recycling. There is an above-ground waste oil storage tank at Building 90126, and there are 34 oil water separators at various locations on base.

3.2.6.2 Hazardous Materials

As defined in 49 CFR Section 171.8, hazardous materials are materials that have been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce. Operations at Hurlburt Field require the use and storage of many hazardous materials. Hazardous materials management is the responsibility of each individual or organization. A HazMart located on base is responsible for the distribution of most hazardous materials; however, some contractors deliver directly to the users. The Environmental Management Information System must be utilized whenever hazardous materials are ordered. This tracking system is used by Bioenvironmental Engineering and the Fire Department. Both organizations must give their approval for hazardous material purchases.

The CV-22 aircraft has been designed to minimize scheduled maintenance actions. The goal is to provide combat-ready aircraft to meet all operational tasks with reliable combat ready sources. Pollution prevention has been an integral part of the CV-22 design. Many hazardous substances have been eliminated in the construction and maintenance of the aircraft.

3.2.6.3 Stored Fuel

There are 25 aboveground storage tanks (ASTs) on Hurlburt Field that store fuel. Their capacities range from 1,000 to 840,000 gallons. They store primarily JP-8, gasoline, and diesel fuel for vehicles and aircraft (DEP, 2000). Fuel is delivered to the base by tank trucks. All underground storage tanks (USTs) have been removed from Hurlburt Field. The work was completed in April 1995.

3.2.6.4 Asbestos

The current Air Force policy is to manage or abate asbestos-containing material (ACM) in active facilities and remove ACM, following regulatory requirements, before facility demolition. ACM is abated when there is a potential for asbestos fiber release that would affect the environment or human health.

The 1996 Asbestos Management/Operating Plan identifies procedures for management and abatement of asbestos. Prior to renovations or demolition of all existing non-residential buildings, asbestos sampling is performed by a contractor to determine the percent and type of asbestos in the material. Asbestos-containing material would be removed prior to the demolition or renovation of any facility in accordance with applicable Federal, State, and local regulations (USAF, 1996a).

3.2.6.5 Lead-Based Paint

Air Force Policy (1993) ensures that lead-based paint (LBP) hazards are avoided or abated during building modifications. The existing buildings and structures proposed for renovation may contain LBP. Before any building demolition or modifications, the construction contractor may be required to conduct an LBP survey. According to Bioenvironmental Engineering, buildings constructed after 1985 are exempt from testing and assumed to be LBP-free (USAF, 1995).

The Base engineer assumes that all structures constructed prior to 1985 potentially contain LBP. LBP abatement is accomplished in accordance with applicable Federal, State, and local regulations prior to demolition or renovation activities to prevent any health hazards.

3.2.7 Water Resources

Water resources include both surface and subsurface water. Surface water includes all lakes, ponds, rivers, streams, impoundments, and wetlands within a defined area or watershed. Subsurface water, commonly referred to as groundwater, typically is found in certain areas known as aquifers. Aquifers are areas of mostly high porosity soil where water can be stored between soil particles and within soil pore spaces. Groundwater is usually recharged during rain events and is withdrawn for domestic, agricultural, and industrial purposes. The CWA of 1972 is the primary Federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters.

Water resources analyzed in this section include the watersheds and aquifers associated with Hurlburt Field. Flood hazards associated with the 100-year floodplain are also addressed in this section. Activities occurring within the affected airspace are not analyzed because water resources in these areas would not be affected by proposed aircraft operations.

3.2.7.1 Surface Water

Hurlburt Field generally is divided into two drainage basins or watershed regions. The northern two-thirds of the base predominantly drains north to northwest into East Bay Swamp. The southern third drains surface waters southward into Santa Rosa Sound. Surface waters in East Bay Swamp and East Bay River flow westward into East Bay. Man-made drainage ditches direct surface water flow into wetlands and watersheds to the north or south. Many of these drainages are intercepted by storm water retention basins, and at least five small drainages divert surface waters from the main containment area south to Santa Rosa Sound. A small area of land adjacent to the golf course drains eastward into Cinco Bayou and continues onto Choctawhatchee Bay (USAF, 1996c).

Extensive swamps, marshes, ponds, and bayous occur in and around Hurlburt Field. These wetland areas comprise a major portion of the terrain and are discussed in Section 3.2.8. There are approximately 21 waterbodies within Hurlburt Field. The largest is Hurlburt Lake which covers 25 acres, and it receives flow from a number of interconnected golf course ponds, overland flow, seepages, and springs. The vast majority of the other ponded areas occur in and adjacent to the golf course and northeast flight line.

3.2.7.2 Floodplains

Executive Order 11988, Floodplains Management, directs government agencies to avoid adverse effects and incompatible development in floodplains. If construction is unavoidable, then agencies must ensure the action conforms to applicable floodplain protection standards, and that accepted flood-proofing and other flood protection measures are applied to the construction.

Regions of the 100-year floodplain are extensive on Hurlburt Field. Most of the northwest and much of the northeast portions of the base occur within the 100-year floodplain. Scattered, isolated floodplain pockets occur east and west of the airfield, and a floodplain/storm surge fringe exists where the base borders Santa Rosa Sound (USAF, 1996c).

3.2.7.3 Groundwater

Hurlburt Field is underlain by a surficial sand and gravel aquifer and the Floridan aquifer. These are the principle aquifers that serve the region. The top of the Floridan aquifer lies 500 to 600 feet below MSL, and it averages more than 1,000 feet in thickness. It produces well yields from several hundred to over 10,000 gallons per minute (gpm).

The Floridan aquifer is composed mostly of a thick sequence of interbedded limestones and dolomites. The great thickness and low permeability of the Pensacola clay that lies between the sand and gravel aquifer and the Floridan aquifer, helps protect the Floridan aquifer from any contaminants associated with direct recharge and from surface contamination sources. Also, there is a clay layer that acts as a confining bed to separate the aquifer into upper and lower limestone units. The lower limestone unit is saline and is not utilized as a water source. The main water supply source at Hurlburt Field is from the upper Floridan aquifer (USAF, 1996c). Hurlburt Field pumped 246,656.3 gallons from the Floridan aquifer in 1999 under the Northwest Florida Water Management District's permit number 842711 (USAF, 2000a). Local community water suppliers that share the groundwater supply with Hurlburt Field include Mary Esther and Okaloosa County. The Floridan aquifer supplies most of the water needs in Okaloosa and Walton counties as well.

The shallow aquifer is used by some communities and Santa Rosa Utilities Inc. as a water supply. The water requires treatment prior to potable water use due to high iron and tannin levels, as well as a low pH. The shallow aquifer consists of the Citronelle Formation and marine terrace deposits. Along coastal areas the water table is typically at or near the surface while it is considerably deeper inland. The maximum thickness of the surficial sand and gravel aquifer at Hurlburt Field ranges from 150 feet to the east and 200 feet near the center of the installation. The main producing zone located southeast of Hurlburt Field is capable of yielding more than 300 gpm. In the western portion of the installation, the water table occurs at considerable depth below the land surface (USAF, 1996c). In 1999, Hurlburt Field pumped 49,419 gallons of irrigation water under Northwest Florida Water Management District's permit number 910115 from the shallow sand and gravel aquifer (USAF, 2000b).

3.2.8 Biological Resources

3.2.8.1 Vegetative Communities

Hurlburt Field contains a mixture of upland and wetland vegetative communities including cypress-gum swamps, bay swamps, pine flatwoods, sandhill, sand pine scrub, scrub-shrub wetlands, herbaceous wetlands, maritime hammock, open grassland (unimproved and maintained), and some disturbed plant communities. The following describes upland communities found at Hurlburt Field (USAF, 1997).

<u>Sand Pine Scrub:</u> The sand pine scrub community is synonymous with scrub, Florida scrub, sand scrub, rosemary scrub, and oak scrub communities. Sand pine scrub areas are scattered throughout the base and include sand pine (*Pinus clausa*), sand live oak (*Quercus geminata*), myrtle oak (*Quercus myrtifolia*), saw palmetto (*Serenoa repens*), rosemary (*Ceratiola ericoides*), and rusty lyonia (*Lyonia ferruginea*).

Scrub habitats are essentially fire-maintained communities. Scrub communities occur on sand ridges along former shorelines (ridges derived from wind-deposited dunes or wave-washed sandbars). Sand pine scrub is often characterized as a closed to open canopy forest of sand pines with dense areas or vast thickets of scrub oaks and other shrubs dominating the understory. It is estimated that scrub habitats catastrophically burn once every 20 to 80 years or longer (USDoA, 1995).

Sandhill: The sandhill community is synonymous with several vegetative descriptions including longleaf pine - turkey oak, longleaf pine - xerophytic oak, longleaf pine - deciduous oak, and high pine. Sandhill regions are dominated by longleaf pine (*Pinus palustris*), saw palmetto, and wiregrass (*Aristida stricta*). The sandhill community also includes turkey oak (*Quercus laevis*), sand post oak (*Quercus geminata*), sparkleberry (*Vaccininum arboreum*), and bracken fern (*Pteridium aquilinum*). Fire is a dominant ecological factor in this community. Sandhills require frequent fires, with the natural fire frequency occurring every two to five years (USDoA, 1995).

Pine flatwoods: Pine flatwoods occur frequently throughout Hurlburt Field. Pine flatwoods generally are characterized by a relatively open overstory of pines, an extensive low shrub understory, and a variable and often sparse herbaceous groundcover. Pine flatwoods areas are dominated by longleaf pine, slash pine (*Pinus elliottii*), running oak (*Quercus pumila*), gallberry (*Ilex glabra*), saw palmetto, sawbrier (*Smilax glauca*), and wiregrass (USDoA, 1995).

Maritime Hammock: Maritime Hammock also is described as coastal hammock, maritime forest, and tropical hammock. This habitat is characterized as a narrow band of hardwood forest inland of the coastal strand community (wind-deposited coastal dunes with a dense thicket of salt-tolerant shrubs). Dominant vegetation includes live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), and redbay (*Persea berbonia*). Other common vegetation includes American holly (*Ilex opaca*), southern magnolia (*Magnolia grandiflora*), red cedar (*Juniperus virginiana*), saw palmetto, poison ivy (*Toxicodendron radicans*), and wild coffee (*Psychotria* spp.) (USDoA, 1995).

Grasslands: This habitat category includes both the unimproved areas (i.e. prairies) and maintained areas (turf and landscaped areas). The unimproved areas are characterized as nearly treeless with a dense groundcover of wiregrass, saw palmetto, various grasses, herbs, and low shrubs. The maintained areas (improved and semi-improved) encompass approximately 1,508 acres at Hurlburt Field. These maintained areas typically are dominated by turf grasses including centipede grass (*Eremóchloa ophiuroídes*), common bermuda grass (*Cynodon dáctylon*), St. Augustine grass (*Stenotaphrum secundátum*), and Argentine bahia grass (*Paspalum notátum*) (USDoA, 1995).

3.2.8.2 Wetlands

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (U.S. Army Corps of Engineers, 1987). Areas that are periodically wet but do not meet all three criteria (hydrophytic vegetation, hydric soils, and wetland hydrology) are not jurisdictional wetlands subject to Section 404 of the Federal Water Pollution Control Act (Clean Water Act). Nor are they subject to the swampbuster provision of the Federal Food Security Act. Areas that have been disturbed or are classified as problem area wetlands, however, may not meet all three criteria as a result of natural or man-induced reasons; yet they still are considered wetlands (USAF, 1996c).

Hurlburt Field is generally divided into two drainage basins or watershed regions. The northern two-thirds of the base primarily drains to the north and northwest into East Bay Swamp. The remaining southern portion of the base drains southward into Santa Rosa Sound. Wetland areas comprise a major portion of the base with approximately 3,300 acres or 50 percent of the entire installation. The following describes wetland communities found at Hurlburt Field (USAF, 1998a).

<u>Cypress-gum swamps:</u> Cypress-gum swamps dominant vegetation consists of bald cypress (*Taxodium distichum*) and tupelo gum (*Nyssa sylvatica*). The

understory and groundcover are typically very sparse. Other common vegetation include ogeechee tupelo (*Nyssa ogeche*), water tupelo (*Nyssa aquatica*), swamp titi (*Cyrilla racemiflora*), wax myrtle (*Myrica cerifera*), dahoon holly (*Ilex cassine*), and swamp privet (*Forestiera acuminata*) (UCF, 1991).

<u>Bay swamp:</u> This wetland habitat generally is characterized as a relatively large and irregularly shaped basin. Bay swamps typically are not associated with rivers but are vegetated with hydrophytic trees and shrubs that can withstand an extended hydroperiod. Dominant plant species include tupelo gum, cypress, swamp redbay (*Persea palustris*), and slash pine. Other typical plant species present in Bay swamps include red maple (*Acer rubrum*), sweetbay magnolia (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*), wax myrtle, and titi (*Cyrilla racemiflora*) (UCF, 1991).

<u>Scrub-shrub wetlands:</u> Scrub-shrub wetlands frequently are dominated by titi, black titi (*Cliftonia monophylla*) and fetterbush. These wetlands are nutrient poor with infertile soils. Vegetation in these wetlands depend on mycorrhizal fungi to obtain sufficient nutrients for their survival. These wetlands typically are fire dependent for regeneration (UCF, 1991).

<u>Herbaceous wetlands:</u> The herbaceous wetlands are synonymous with several vegetative descriptions including swamps, freshwater marsh, and marsh. Typical vegetation includes soft rush (*Juncus effusus*), pennywort (*Hydrocotyl* spp.), saltbush (*Baccharis halimifolia*), elderberry (*Sambucus canadensis*), spikerush (*Eleocharis* spp.), arrowhead (*Saggitaria lancifolia*), buttonbush (*Cephalanthus occidentalis*), and redroot (*Lachnanthes caroliniana*) (UCF, 1991).

3.2.8.3 Wildlife

In 1996 and 1997, the Nature Conservancy/Florida Natural Areas Inventory (FNAI) conducted a Rare Plant, Rare Vertebrate, and Natural Community Survey on Hurlburt Field. The results of the survey were submitted to the Environmental Flight at Hurlburt Field in July 1997. The report described fourteen rare plants, nine rare vertebrates, and ten separate natural community types on the base.

The forested wetlands and pine flatwoods support a diversity of wildlife species on base. The majority of these areas are pine flatwoods forests on the western side of the base. The pine flatwood areas will enhance the habitat value of the adjacent wetlands and will provide a large contiguous area with a variety of wildlife habitats. Preservation of these flatwoods also will preserve valuable habitat for species that rely on wetlands, uplands, and the mesic interface of the two habitat types for a part of their life cycle. For example, the flatwoods salamander *(Ambystoma cingulatum*) spends the majority of its life cycle in pine flatwoods. However, in the late fall and winter, these salamanders move to cypress heads or shallow ponds to lay their eggs. When the eggs hatch, the salamanders spend another 90 days in the wetland before metamorphosis into adulthood. The Eastern Tiger Salamander (*Ambystoma tigrinum tigrinum*) has similar habitat requirements but is more widespread in Florida. Numerous species are known to occur, or potentially occur, on base (USAF, 1996c). These species include but are not limited to the following:

- Reptile and amphibian species-Eastern garter snake (*Thamnophis sirtalis*), southern black racer (*Coluber constrictor priapus*), ground skink (*Scincella lateralis*), and the southern toad (*Bufo terrestris*).
- Mammal species-white-tailed deer (*Odocoileus virginianus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), fox

squirrel (*Sciurus niger shermani*), and hispid cotton rat (*Sigmodon hispidus*).

- Avian species-mourning dove (*Zenaida macroura*), red-bellied woodpecker (*Melanerpes carolinus*), blue jay (*Cyanocitta cristata*), pine warbler (*Dendroica pinus*), northern mocking bird (*Mimus polyglottos*), great crested flycatcher (*Myiarchus crinitus*), prothonotary warbler (*Protonotaria citre*a), summer tanager (*Piranga rubra*), and red-shouldered hawk (*Buteo lineatus*). In addition, numerous non-breeding migrants commonly pass through the region in the spring and fall.

3.2.8.4 Endangered, Threatened, and Species of Special Concern

The U.S. Fish and Wildlife Service (USFWS) lists species that are endangered or threatened and those that are proposed for endangered or threatened status. An endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Hurlburt Field contains habitats utilized by a large number of Federally and State-listed species. Those listed species that are known to occur within or near its boundaries are listed in Appendix H (USAF, 1996c).

Species (flora and fauna) listed by Federal or State agencies as endangered, threatened, or of special concern and known to occur permanently or periodically, or having the potential to occur on base are shown in Appendix H. Threatened and endangered species located within the LATN area in Georgia, South Carolina, North Carolina, Alabama, and Tennessee also are included in Appendix H.

3.2.8.5 Coastal Zone Management

The entire State of Florida is defined as being within the coastal zone; thus, any Federal activity in or affecting a coastal zone in Florida requires preparation of a Coastal Zone Consistency Determination in accordance with the Federal Coastal Zone Management Act of 1972. The act was passed to preserve, protect, develop, and (where possible) restore or enhance the nation's natural coastal zone resources.

The Florida Coastal Management Act was created as a result of the Federal Coastal Zone Management Act of 1972. The Florida Coastal Management Program (FCMP) is designed to protect coastal resources, as well as helping Floridians build and maintain vital communities. The FCMP coordinates the review of State and Federal activities through eight state agencies, five water management districts, and local governments to ensure that these activities will not impact coastal resources. The Florida Department of Community Affairs serves as the lead agency for the FCMP. The entire state of Florida is considered to be within the coastal zone. Under this program, permits are required for any erosion control devices, excavations, or erection of structures within the coastal construction control line (CCCL). This line extends landward from the shores along the Gulf of Mexico, excluding Choctawhatchee Bay, and is determined by the state based on the potential inland extent of erosion due to a 100-year storm. As Hurlburt Field borders Santa Rosa Sound, that portion of the mainland has no designated CCCL; however, county regulations require a 50-foot setback from the mean high water line for all new principal structures.

The Florida Department of Community Affairs (FDCA) is the state's lead coastal management agency. The Air Force is responsible for making the final coastal zone consistency determinations for its activities within the state, and FDCA reviews the coastal zone consistency determination. A consistency statement appears in Appendix C.

3.2.8.6 Biological Resources of LATN Areas

There are three ecological regions, as defined by Robert Bailey *Descriptions of the Ecoregions of the United States*, within the LATN area. These regions are the Outer Coastal Plain, the Southeastern Mixed Forest, and the Eastern Deciduous Forest (USAF, 1994). The regions are differentiated by the variations in climate, vegetation, and the landforms that are important in the development of the ecosystems.

<u>Outer Coastal Plain Forest:</u> The Outer Coastal Plain Forest is restricted to the flat and irregular southern Gulf Coastal Plain including central and north Florida, southern Georgia, Alabama, Mississippi, Louisiana, and areas along the Mississippi River up to southern Illinois. This region can be characterized as a temperate rainforest with annual precipitation ranging from 40 to 60 inches. This region differs from the equatorial and tropical rainforest by having large populations of individual tree species and fewer tree species overall. Predominate tree species include loblolly pine (*Pinus taeda*) and slash pine in the upland areas (xerophytic), bald cypress in the wetlands (hydrophytic), and a climax vegetation of evergreen-oak and magnolia forest in the mesophytic habitats. The mesic forests have a well-developed lower stratum of vegetation that typically includes tree ferns, small palms, shrubs, and herbaceous vegetation (USDoA, 1995).

The Outer Coastal Plain Forest provides a habitat for a wide variety of animals including the black bear (*Ursus americanus*), white-tailed deer, raccoon, opossum (*Didelphis virginiana*), squirrel (Sciurus spp.), numerous ground-dwelling rodents, red-cockaded woodpecker (*Picoides borealis*), bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*), various nongame bird species and migratory waterfowl, and the American alligator (*Alligator mississippiensis*).

Southeastern Deciduous Forest: This region generally occurs on the irregular Gulf Coastal Plain and Piedmont and has gentle slopes and local relief of less than 100 feet. This region contains numerous sluggish streams and marshes, lakes, and swamps. The Southeastern Mixed Forest occurs in the mid-regions of the following states: Missouri, Mississippi, Alabama, and Georgia. Also included are the eastern portions of South Carolina, North Carolina, Virginia and Maryland. This region contains tall forests of broadleaf and needle leaf evergreen trees including loblolly pine, shortleaf pine (*Pinus echinata*), various oaks (*Quercus* spp.), hickory (*Carya* spp.), sweetgum (*Liquidambar styraciflua*), red maple, and winged elm (*Ulmus alata*). Understory and groundcover vegetation includes bluestem (*Schizachyrium tenerum*) panicum grasses (*Panicum spp*.), dogwood (*Cornus florida*), American beautyberry (*Callicarpa americana*), yaupon holly *(Illex vomitoria*), and numerous woody vines (USDoA, 1995).

The fauna of the Southeastern Mixed Forest vary with the age of the timber stand, percent of deciduous trees, and presence of bottomland forest communities. Species found in this region include white-tailed deer, squirrels, raccoons, wild turkeys, bobwhite quail, and mourning doves. Mature forests may support approximately 240 breeding pairs of birds per 100 acres.

Eastern Deciduous Forest: This region covers most of the remaining U.S. except for New England, Michigan, Wisconsin and Minnesota. It contains tall broadleaf trees that shed their leaves in winter and provide a continuous, dense canopy in summer. There is an understory of small trees and shrubs, and in spring a dense layer of herbs develops. Common trees include oak, beech (Fagus grandifolia), birch (Betula spp.), hickory, maple (Acer spp.), basswood (Tilia spp.), elm (Ulmus spp.), ash (Fraxinus spp.), and tulip tree (Liriodendron tulipifera). In poorly drained areas, alder (Alnus spp.), willow (Salix spp.), ash, and elm are found. The fauna in the Eastern Deciduous Forest include the white-tailed deer, black bear, bobcat (Felis rufus), gray fox (Urocyon cinereoargenteus), raccoon, gray squirrel (Sciurus carolinensis), fox squirrel (Sciurus niger), eastern chipmunk (Tamias striatus), white-footed mouse (Peromyscus leucopus), pine vole (Microtus pinetorum), short-tailed shrew (Blarina brevicauda), and cotton mouse (Peromyseus gossypinus). There is a large and varied bird population. Mature forests can support approximately 225 breeding pairs of birds per 100 acres (USDoA, 1995).

3.2.9 Geology and Soils

The general geologic sequence found above bedrock includes Jurassic evaporates, carbonates, and sandstones and shales of the Cretaceous and early Eocene age overlain by the Claiborne Group. The Claiborne Group consists of low permeability shales and limestones. The Ocala Group overlies the Claiborne Group and is permeable limestone composed primarily of fossils. The Buccatunna Clay is at the top of the Ocala Group and is overlain by the Chickasawhay and the Tampa Formations, that consist of Vesicular limestone and dolomite with enlarged pores and fractures created by solution and acidic groundwater. Pensacola Clay overlies the Tampa Formation. The clay has very low permeability overall but becomes more coarse and permeable north and east of the base. The Pensacola Clay is overlain by the surficial aquifer that consists of a layer of gravel, sands, and clay (USAF, 1996c).

The soils at Hurlburt Field are derived from sedimentary deposits of fluvial and marine origin. The majority of soils are sandy and have low fertility. Soil density is relatively low, reflecting the high permeability of the surface soils and the relatively low direct runoff in the area. Erosion potential for all soils is low due to the level topography, with the exception of the soils along the Santa Rosa Sound that have moderate erosion potential. The near surface mineral resources occurring on Hurlburt Field are sand, gravel, quartz, and clay. Prime farmland soils do not occur within the installation. Hurlburt Field does not contain sinkholes and is considered to be located in an area with no reasonable expectancy of earthquake damage (USAF, 1996c).

3.2.10 Cultural Resources

The protection and management of cultural resources is required by a number of Federal laws including the National Historic Preservation Act (NHPA), the Archaeological Resource Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the Archaeological and Historic Preservation Act (AHPA). Of particular note to military installations are sections 106 and 110 of the NHPA. Section 106 provides direction for Federal agencies for undertakings that affect properties listed, or eligible for listing, on the National Register of Historic Places (NRHP). Section 110 requires federal agencies to locate, inventory, and nominate all properties that may qualify for the NRHP.

Cultural resources consist of prehistoric and historic districts, sites, structures, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources (prehistoric and historic), architectural resources, and traditional cultural resources.

3.2.10.1 Archaeological Resources

Archaeological resources (prehistoric and historic) are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., tools, arrowheads, or bottles). “Prehistoric” refers to resources that predate the advent of written records in a region. These resources can range from a scatter composed of a few artifacts to village sites and rock art. “Historic” refers to resources that postdate the advent of written records in a region. Archaeological resources can include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features. Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for protection under existing cultural resource laws; however, more recent structures, such as Cold War era military buildings, may warrant protection if they have the potential to be historically significant structures. Architectural resources must also possess integrity, meaning its important historic features must be present and recognizable.

3.2.10.2 Traditional Cultural Resources

Traditional cultural resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the continuance of traditional cultures.

To be considered significant, archaeological or architectural resources must meet one or more criteria as defined in 36 Code of Federal Regulations (CFR) 60.4 for inclusion in the National Register of Historic Places (NRHP). A new DoD policy regarding consultations with Native Americans was finalized in 2000. The policy recognized the importance of understanding and addressing tribal concerns prior to reaching decisions on matters that may affect protected tribal resources, tribal rites or tribal lands.

There are no legally established criteria for assessing the importance of traditional cultural resources. These criteria must be established through consultation with Native Americans, in accordance with the requirements of the NHPA. When applicable, consultation with other affected groups provides the means to establish the importance of their traditional resources. This also can be accomplished using 36 CFR 60.4 and the Advisory Council on Historic

Preservation Guidelines. The Native American Graves Protection and Repatriation Act (1990) defines the procedures for consultation and treatment of Native American burials and burial artifacts.

Resources addressed at Hurlburt Field include archaeological, architectural, and traditional cultural resources. Past surveys at Hurlburt Field have located relatively few archaeological resources. Previous cultural resource investigations included one conducted from 1982 to 1990 as part of the large-scale Historic Preservation Plan for Eglin AFB, a National Park Service survey of five project areas in 1988, and several surveys by the Army Corp of Engineers (USACE) between 1991 and 1994.

The entire installation has not been intensively surveyed for archaeological resources, but a probability model of the installation was prepared to identify portions of Hurlburt Field where archaeological resources are likely or not likely to be revealed. Most of the installation is within a low probability zone, which is not likely to reveal any archaeological resources. The area within Hurlburt Field considered to have the highest potential for historic resources is the narrow strip between the north shore of Santa Rosa Sound and US Highway 98. This area was surveyed in 1987. The survey identified a total of seven prehistoric or historic archaeological sites along the shoreline of Santa Rosa Sound, and five additional prehistoric archaeological sites were recorded on the main base (two on the west side and one on the southeast portion) of Hurlburt Field. Three of the seven archaeological sites along the Sound are eligible for the NRHP. All three sites on the main base were deemed not eligible for the NRHP.

To determine if any historic structures were eligible for listing on the NRHP, an architectural reconnaissance survey was conducted in 1995. The survey identified six structures that met the minimum age for listing on the NRHP;

however, it was determined that they were not eligible for listing. There are no known historic structures or districts that are eligible for the NRHP.

Aircraft operations associated with the Proposed Action would largely affect only airspace and airspace-related resources; however, aircraft overflights do have the potential to affect existing or potentially occurring archaeological, architectural, or traditional cultural resources. The noise and visual presence from such overflights may have indirect impacts on cultural resources; the significance of such impacts is based on the integrity and characteristics of the setting. In contrast, direct impacts (e.g., ground disturbance) would not result from overflights. Therefore, this EA examines only those resources whose setting might be affected, including NRHP-listed or eligible archaeological and architectural resources (e.g., historic structures).

3.2.11 Land Use

3.2.11.1 Off Base Land Use

Hurlburt Field lies within the region of the Florida Panhandle known as the Emerald Coast. This coastal area is known for the beauty of its white sandy beaches and blue-green water, and for its favorable climate.

Hurlburt Field lies within Okaloosa County, Florida, and is surrounded by the city of Mary Esther, Fort Walton Beach, Santa Rosa Sound, and Eglin AFB. Other incorporated areas in the vicinity include Wright, Shalimar, Ocean City, and Cinco Bayou. These towns are all located to the east of the base in the Fort Walton Beach urban area.

There are three jurisdictions bordering Hurlburt Field to the east. Mary Esther is located between Santa Rosa Sound and Hollywood Boulevard. Fort Walton Beach is located between Hollywood Boulevard and Lovejoy Road (Lovejoy Road accesses the base as Independence Road). An unicorporated portion of Okaloosa County is located between Lovejoy Boulevard and Hurlburt Field. The land use in this area is primarily low-density, single-family residential and is fully developed in Mary Esther and Fort Walton Beach. The Okaloosa County portion is only partially developed. The long range land use plan for all three jurisdictions shows this area as low-density, single-family residential, except for a small undeveloped area north of Lovejoy Boulevard near Martin Luther King Jr. Boulevard that is designated as mixed use. The region of influence for land use impacts of the Proposed Action is primarily the area immediately surrounding Hurlburt Field.

On the southwest side of the base is the unincorporated area of Florosa. This is primarily low-density, single-family residential, with a row of commercial land uses fronting US 98 on both sides. Florosa Elementary School is located near Lamar Street on US 98 approximately one mile west of the Hurlburt Field western boundary. Eglin AFB is located on the west and north sides of Hurlburt Field and is generally undeveloped in this area.

Local development has been guided by careful planning and zoning, assuring compatibility with base operations while meeting the needs of the general community. Hurlburt Field works closely with the local officials to ensure that development on and around the base is compatible and appropriate. Hurlburt Field and Eglin AFB are represented on the Okaloosa County Comprehensive Plan Committee as non-voting members.

The Air Installation Compatible Use Zone (AICUZ) was developed by the DoD to encourage land use compatibility between DoD air stations and local communities while maintaining the operational integrity of the station. The plan was developed by incorporating up to three levels of accident potential zones (APZs) including the clear zones, and average noise level contours. The APZs consist of the runways and areas within a few hundred feet, and largely overlie the air station. Noise contours of 65 dB or greater extend off base from Hurlburt

Field to the south over a portion of Santa Rosa Island (Eglin AFB) and into the Gulf of Mexico. These noise contours do not affect any off base developed areas but could impact recreational boaters in the area. (See Section 3.2.5 for greater detail on noise impacts.)

Current operations at Hurlburt Field utilize runway 18/36 for take-offs and landings. This runway is oriented in a north-south configuration. Due to the prevailing winds in the area, approximately 60 percent of the current fixed-wing aircraft take-offs and 56 percent of the rotary wing aircraft take-offs utilize runway 36, which will position the aircraft over unoccupied sections of Eglin AFB.

The *West Florida Strategic Regional Policy Plan,* developed by the West Florida Regional Planning Council, cites the importance of Hurlburt Field and other military installations in its *Plan.* One of the goals of the plan is to "Maintain the presence of military missions in the region." While Hurlburt Field is not specifically mentioned in the *Florida State Comprehensive Plan*, the activities of Hurlburt Field are compatible with the *Plan*.

3.2.11.2 On Base Land Use

Hurlburt Field is currently in the process of updating their Land Use Plan that was developed in 1994. The updated document, *Land Use and Community Center Plans,* identifies thirteen land use designations for Hurlburt Field. These designations are:

- Runway Primary Surface and Clear Zones
- Aircraft Runway/Taxiway
- Aircraft Operations and Maintenance
- Industrial
- Administrative
- Community Commercial
- Community Service

- Medical
- Accompanied Housing
- Unaccompanied Housing
- Outdoor Recreation
- Open Space
- Water

The plan stresses that land uses on Hurlburt Field should be located to maximize their functional relationships and to minimize conflicts. For example, aircraft operations should be located near aircraft runways and taxiways for operational efficiency; however, housing should not be located near runways due to noise considerations

Runway 18/36 is oriented north-south and located in the eastern portion of the field. Aircraft operations and maintenance facilities are located on either side of the runway, as well as industrial facilities. The majority of the residential housing is located near the center of the field, 3,500 feet or more west of the runway. There is also a large accompanied housing area in the far northeastern corner of the base. Commercial areas generally are oriented to the residential areas, except for the new commissary and Base Exchange (BX), which are located on the east side of the runway, near the medical complex. Recreational facilities are interspersed around the residential areas, with the exception of the golf course which is located in the northeastern portion of the base to the east of the runway.

The functional relationship of the existing land uses at Hurlburt Field is generally good; however, there were some relationships that the plan recommended for improvement.

- Minimize conflict between administration and aircraft operations and maintenance activities

- Improve relationship between accompanied housing and community commercial uses
- Improve availability of outdoor recreation opportunities in accompanied housing areas
- Improve availability of medical facilities in unaccompanied housing areas
- Continue development of aircraft operations and maintenance activities along the flight line

The future land use proposed for Hurlburt Field in the updated plan complements the existing functional relationships of the base land uses and builds upon the recommended improvements described above. Many of the land use categories are projected to expand in their current location, including housing, aircraft operations and maintenance, and industrial areas. Administrative activities will consolidate into a ”core area” in the southern portion of the base. Commercial areas are proposed to expand near the BX to the east of the runway and also near the golf course in the northeast corner of the base. The commercial area south of US 98 is projected to decrease in size.

3.2.12 Environmental Justice

3.2.12.1 Background

Executive Order (EO) 12898, Environmental Justice, was issued by the President on February 11, 1994. Objectives of the EO, as it pertains to this EA, include development of federal agency implementation strategies, identification of minority and low-income populations where proposed federal actions have disproportionately high and adverse human health and environmental effects, and participation of minority and low-income populations. Accompanying EO 12898 was a Presidential Memorandum that referenced existing federal statutes and regulations to be used in conjunction with EO 12898. The memorandum addressed the use of the policies and procedures of the NEPA. Specifically, the memorandum indicates that, “each Federal agency shall analyze the environmental effects, including human health, economic and social effects of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. section 4321, et seq." Although an environmental justice analysis is not mandated by NEPA or by Air Force Instruction (AFI) 32-7061, the DoD has directed that NEPA will be used as the primary approach to implement the provisions of the Executive Order.

3.2.12.2 Demographic Analysis

EO 12898 provides no guidelines as to how to determine concentrations of minority or low-income populations. It requires Federal agencies to consider disproportionately high and adverse environmental effects on minority and low-income populations. The "Guide for Environmental Justice Analysis with the Environmental Impact Analysis Process (EIAP)" dated November 1997 was developed by the Department of the Air Force to give guidance in conducting environmental justice analyses. A demographic analysis provided information on the approximate locations of minority and low-income populations in the area potentially affected by the Proposed Action at Hurlburt Field. Most environmental impacts associated from the action would be expected to occur within Okaloosa County.

Estimates prepared by the Bureau of Census reports numbers of both minority and poverty residents. Minority populations included in the census are identified as Black; American Indian, Eskimo or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty status is reported as the number of families with income below poverty level ($15,569 for a family of four in 1995, as reported in the Bureau of Census WebPages). The Bureau of Census estimated that Okaloosa County had a population of 169,289 persons in 1998. Of this total, 33,011 persons, or 19.5 percent, were classified as minorities by the Census Bureau. The population of the State of Florida was estimated as 31.4 percent minority in 1998.

The Bureau of Census estimated that 10.7 percent of the Okaloosa County population had income below the poverty level in 1995, compared to 15.2 percent of the Florida population.

Information contained in the 1990 Census indicated that a Census Tract located adjacent to Hurlburt Field to the east contained a concentration of both minority and impoverished persons that was approximately one-third greater than the countywide average for those characteristics.

While most of the environmental justice impacts associated with the Proposed Action would be expected to occur near Hurlburt Field, there is the potential for environmental justice impacts in the overflight areas of the five southeastern states comprising the military training routes. The military training routes pass over portions of Florida, Alabama, Georgia, Tennessee, and North Carolina (see section 3.2.3.3).

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SECTION 4.0
ENVIRONMENTAL CONSEQUENCES

The effects that the Proposed Action and alternatives will have on the affected environment are discussed in this section.

4.1 Airfield and Airspace Operations

The purpose of this section is to describe the operations associated with the Proposed Action at Hurlburt Field and the related airspace components of interest. The Proposed Action is the beddown of CV-22 Osprey within AFSOC at Hurlburt Field, Florida. It calls for a progressive retirement of the currently operational MH-53J Pave Low III and the previously retired MH-60G Pave Hawk helicopters and the fielding of 28 CV-22 aircraft. The time frame for the implementation of this action is CY04 to CY12 and beyond.

As part of the Proposed Action, Hurlburt Field is expected to designate a landing lane 1800 feet long and 200 feet wide, east of and parallel to Runway 18/36. This landing lane would be created through re-allocation of existing runway/taxiway surfaces and function as a parallel taxiway as well as three helicopter landing pads. No new runway construction is projected as part of this action. The three helicopter landing pads on this short lane would be able to accommodate the CV-22 aircraft. The helicopter landing pads would be located 200 feet from either end of the short lane and 400 feet apart. It is expected that current helicopter landing pad Delta would close upon completion of the short lane. Figure 2.1 illustrates the proposed changes at Hurlburt Field.

4.1.1 Airfield Operations

Section 4.1.1a. discusses the annual flight operations by aircraft type and operation type for CY12. Overall, the tempo of operations of aircraft expected to operate at Hurlburt Field in the future is projected to remain constant, as presented in Section 3.2.1.1. CV-22 projected operations have been added while MH-53J Pave Low III, MH-60G Pave Hawk and MC-130E Combat Talon I aircraft operations have been subtracted from total annual operations. Section 4.1.1b discusses runway, flight track utilization, and run-up operations by aircraft type.

4.1.1.a. CY12 Flight Operations

The annual number of flight operations by aircraft type and operation type by temporal period of day (0700-2200) and night (2200-0700) for CY12 are contained in Table 4.1-1 for based squadrons, including the CV-22 aircraft. It is estimated that transient aircraft would conduct approximately 7583 flight operations (approximately 17 percent) at Hurlburt Field in CY12. Projected CV-22 aircraft operations were based on anticipated training requirements, aircraft capabilities and current MH-53J Pave Low III helicopter utilization levels.

For CY12, Hurlburt Field would have 44,039 total annual flight operations, a decrease of approximately 44 percent from CY99 operations levels. The decrease is primarily due to the relocation of the MH-60G and Combat Talon I aircraft, but also to lower operations levels for the CV-22 aircraft versus the MH-53J helicopters in CY99. CV-22 aircraft would conduct approximately 7,990 annual operations in CY12, compared with the 14,550 annual MH-53J helicopter operations in CY99. The CV-22 would account for 18 percent of all

Table 4.1-1.
CY12 Flight Operations for Based Aircraft at Hurlburt Field

Flight		Modeled	Departures			Arrivals			Touch & Go[1]			GCA Box[1]			Teardrop (18-36)[1]			Grand Total		
Squadron	Aircraft	as	0700–2200	2200–0700	TOTAL	0700–2200	2200–0700	TOTAL	0700–2200	2200–0700	TOTAL	0700–2200	2200–0700	TOTAL	0700–2200	2200–0700	TOTAL	0700–2200	2200–0700	TOTAL
16th SOS	AC-130H Spectre Gunship	C-130H&N&P	777		777	255	522	777	1,020	100	1,120	1,020	100	1,120				3,072	722	3,794
4th SOS	AC-130U Spooky Gunship	C-130H&N&P	897	143	1,040	211	829	1,040	208	208	416	6,032	6,032	12,064				7,348	7,212	14,560
6th SOS	UH-1Huey	UH-1N	416	12	428	324	104	428	2,080	1,040	3,120							2,820	1,156	3,976
	C-130E	C-130E	50	10	60	50	10	60	300	72	372				100	20	120	500	112	612
	CASA-212	INM DH-6	200		200	200		200	100		100				40		40	540		540
N/A	CV-22	MV-22	960	960	1,920	480	1,440	1,920	7,800	500	4,150							5,340	2,650	7,990
15th SOS	MC-130P Combat Talon II	C-130H&N&P	978	62	1,040	666	374	1,040	1,664	200	1,864				1,040		1,040	4,348	636	4,984
Total			4,278	1,187	5,465	2,186	3,279	5,465	13,172	2,120	11,142	7,052	6,132	13,184	1,180	20	1,200	23,968	12,488	36,456

airfield operations and 67 percent of all rotary-wing aircraft operations. Overall, nighttime utilization of the airfield would increase to 30 percent.

4.1.1.b. Runway, Flight Track Utilization, and Run-up Ops

All runway and flight track utilization percentages (Table 3.2-2) would remain unchanged for CY12 conditions except for the CV-22. For CY12, the CV-22 would primarily use the newly allocated landing lane described in Section 4.1. Table 4.1-2 presents the CY12 modeled runway utilization percentages. All flight tracks presented in this section remain unchanged from CY99 except that the CV-22 tracks would start and end on the three planned short lane landing pads. In terms of typical flight path directions, all tracks currently utilized at Hurlburt Field were determined as adequate for CV-22 utilization; no new flight tracks were added for CY12. For CY12, it is projected that Hurlburt Filed would yield a total of 112 daily events on the operational flight tracks or departures or arrivals.

Rotary-wing aircraft, including the CV-22, typically do not perform pre-flight run-ups; therefore, none were addressed. Fixed-wing preflight run-ups remained the same as for CY99 conditions presented in Section 3.2.1.1. The duration of the average daily maintenance run-up activity for CY12 is projected to be between 1 minute and 90 minutes. The CV-22 was modeled as the CH-53E and run-up durations were projected to be 10 minutes. Except for run-ups from the three short lane landing spots, other run-up locations are described in CY99.

Table 4.1-2
CY12 Runway Pad Utilization Percentages at Hurlburt Field

Operation Type	Runway/ Pad[1]	Runway Utilization							
		AC-130H	AC-130U	C-12	MC-130P	UH-1N	CV-22	C-130E	Transient
Departure/ Arrival	18	50%	50%	34%	22%		6%	32%	30%
	36	50%	50%	66%	78%		19%	68%	70%
	8CP					59%			
	6CP					41%			
	6S1						6%		
	8S1						19%		
	6S2						6%		
	8S2						19%		
	6S3						6%		
	8S3						19%		
Touch & Go	18	50%	50%	34%	22%	41%	47%	32%	30%
	36	50%	50%	66%	78%	59%	53%	68%	70%
	8CP								
	6CP								
	6S1								
	8S1								
	6S2								
	8S2								
	6S3								
	8S3								
FCF	6S1						16.7%		
	8S1						16.7%		
	6S2						16.7%		
	8S2						16.7%		
	6S3						16.7%		
	8S3						16.7%		
GCA	18	50%	50%	34%	22%			32%	30%
	36	50%	50%	66%	78%			68%	70%
Teardrop	18	50%	50%	34%	22%			32%	
	36	50%	50%	66%	78%			68%	

[1] S1, S2, S3 represent the three planned short lane landing pads

4.1.2 Airspace Operations

Sections 4.1.2a. and 4.1.2b. discuss the CY12 operations associated with the Military Training Route, Restricted Areas, Target Areas and Landing Zone. Each of the airspace components discussed here is described in Section 3.1.2.

4.1.2.a. Military Training Routes

For CY12, HQ AFSOC/DOT personnel estimated the number of annual CV-22 sorties on SR-119 at 468. Table 4.1-3 presents the annual SR-119 day (0700-2200) and night (2200-0700) sorties for CY12**,** and the modeled average speed and power conditions for all aircraft utilizing SR-119. Flight operations on SR-119 would be conducted over a range of altitudes, depending on the type of aircraft and training mission.

Table 4.1-3.
CY12 Sorties and Flight Profiles for SR-119

Aircraft Type	Day Sorties (0700-2200)	Night Sorties (2200-0700)	Total Sorties	Modeled		Typical Altitude Distribution (feet, Above Ground Level) Percent of the Time at Altitude			
				Power Setting	Indicated Airspeed (KIAS)	0-200	200-300	300-500	250-1000
MC-130E	50	350	400	850 C TIT	210				100%
MC-130H	30	250	280	850 C TIT	210				100%
CV-22	36	432	468	84% NR	220	10%	80%	10%	

4.1.2.b. Restricted Areas/Ranges

HQAFSOC/DOT personnel provided sorties and flight profiles data for the CV-22 aircraft utilizing restricted areas R-2915A, R-2915B, R-2914A, R-2919A; target areas A-77, A-78, C-52N and the landing zone at the army ranger camp. CV-22 sorties replaced MH-53J sorties in airspace components. The data for CY12 remains unchanged from CY99. One hundred percent (100%) of the CV-22 flights would be between 0 - 300 feet at an airspeed of 240 knots, and the mission duration would be one hour for all AGC areas except R-2915A, which would be two hours. The total annual sorties are projected to be 420.

4.2 AIR QUALITY

Impacts to air quality would be considered significant if pollutant emissions associated with the implementation of the federal action caused or contributed to a violation of any national or state ambient air quality standard, exposed sensitive receptors to substantially increased pollutant concentrations, represented an increase of ten percent or more in affected AQCR's emissions inventory, or exceeded any significance criteria established by the Florida SIP.

4.2.1 Proposed Action

Construction. Fugitive dust from ground-disturbing activities, combustive emissions from construction equipment, and emissions from asphalt paving operations would be generated during the renovation and demolition of the proposed projects. Fugitive dust would be generated from activities associated with site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed site. These emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions.

The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity. The USEPA has estimated that uncontrolled fugitive dust emissions from ground-disturbing activities would be emitted at a rate of 80 pounds (lbs) of total suspended particulates (TSP) per acre per day of disturbance (USEPA, 1995). In a USEPA study of air sampling data at a distance of 50 meters downwind from construction activities, PM_{10} emissions from various open dust sources were determined based on the ratio of PM_{10} to TSP sampling data. The average PM_{10} to TSP ratios for top soil removal, aggregate hauling, and cut and fill operations are reported as 0.27, 0.23, and 0.22, respectively (USEPA, 1988). Using 0.24 as the average ratio for purposes of analysis, the emission factor for PM_{10} dust emissions becomes 19.2 lbs per acre per day of disturbance. Fugitive dust emissions from demolition activities would be generated primarily from building dismemberment, debris loading, and debris hauling. The USEPA has established a recommended emission factor of

0.011 lbs of PM_{10} per square foot of demolished floor area. This emission factor is based on air sampling data taken from the demolition of a mix of commercial brick, concrete, and steel buildings (USEPA, 1988).

The USEPA also assumes that 230 working days are available per year for construction (accounting for weekends, weather, and holidays), and that only half of these working days would result in uncontrolled fugitive dust emissions at the emitted rate described above (USEPA, 1995). These emissions would produce slightly elevated short-term PM_{10} ambient air concentrations. However, the effects would be temporary and would fall off rapidly with distance from the proposed construction site. The USEPA estimates that the effects of fugitive dust from construction activities would be reduced significantly with an effective watering program. Watering the disturbed area of the construction site twice per day with approximately 3,500 gallons per acre per day would reduce TSP emissions as much as 50 percent (USEPA, 1995). Hurlburt Field would exceed the allowable limit of their potable water permit by adhering to these guidelines. If the construction occurs during a dry period and watering becomes necessary, it may be possible to either drill and utilize a shallow well, to use an existing shallow well, or to truck surface water to the construction site in order to reduce fugitive dust emissions.

Specific information describing the types of construction equipment required for a specific task, the hours the equipment is operated, and the operating conditions vary widely from project to project. For purposes of analysis, these parameters were estimated using established cost estimating methodologies for construction and experience with similar types of construction projects (Means, 1999). Combustive emissions from construction equipment exhausts were estimated from USEPA approved emissions factors for heavy-duty diesel-powered construction equipment (USEPA 1998). Annual construction emissions resulting from the construction of the proposed Flight Simulator (Building 91029) at Hurlburt Field are presented in Table 4.2-1. Estimated pollutant emissions are based on the proposed site areas, the duration of each project, and the specified building square footage for new construction, renovations, and demolition.

Aircraft Operations. Calculations of air pollutant emissions from aircraft operations are based on the annual number of landing-takeoff (LTO) and touch-and-go (TGO) cycles at Hurlburt Field. A LTO cycle includes an approach from 3,000 feet AGL to the airfield, landing, taxi-in to parking position, taxi-out to the runway, take-off, and climbout to 3,000 feet AGL. A TGO cycle is identical to a LTO cycle except that all taxi time has been excluded. The 3,000 feet AGL ceiling was assumed as the atmospheric mixing height above which any pollutants generated would not contribute to increased pollutant concentrations at ground-level. Therefore, all pollutant emissions from operations above 3,000 feet AGL are excluded from this analysis.

For the various flight profiles, published fuel flow rates, times-in-mode, and aircraft engine emission factors were used for estimating pollutant emissions (USAF, 1985; USEPA, 1991). Each flight profile is characterized by one or more modes-of-operation or power settings (e.g., takeoff, climbout, approach, taxi). The USEPA has established default times-in-mode for various categories of aircraft (e.g., air transport, general aviation, military transport, etc.). Published aircraft engine emission factors are based on maximum performance takeoffs and climbouts of commercial aircraft using the commercial version of the aircraft engine. Proposed Action pollutant emissions resulting from increased CV-22 operations and the net change in pollutant emissions within AQCR 5 are also presented in Table 4.2-1.

Table 4.2-1 Proposed Construction Emissions at Hurlburt Field

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 5 Emission Totals[a]	74,603	28,078	110,835	208,375	7,231	7.4
Aircraft Emissions[b]	(12.68)	(4.02)	6.89	(0.48)	5.08	0.00
Construction Emissions[c]	6.04	0.98	13.83	1.46	2.85	0.00
Total Net Change (tpy)	(6.64)	(3.04)	20.72	0.98	7.93	0.00
Percent Change in AQCR 5 (%)	**-0.009**	**-0.01**	**0.02**	**0.0005**	**0.11**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000)
b Estimated from 1999 airfield operations at Hurlburt Field
c Estimated emissions based on building square footage, site areas, and project durations
tpy tons per year

Analysis of the data presented in Table 4.2-1 indicates that the overall ambient air quality within the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR 5 would be slightly affected by CV-22 beddown at Hurlburt Field. Increased emissions from aircraft operations and construction activities would produce slightly elevated air pollutant concentrations; however, the increases would be minimal (not exceeding a 0.12 percent increase for any criteria pollutant) when compared to baseline AQCR 5 emissions. The effects would be temporary and fall off rapidly with distance from the proposed construction site but would not result in any long-term impacts.

4.2.2 No Action Alternative

Under the No Action Alternative, there would not be any change in air quality within the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR 5.

4.3 BIRD-AIRCRAFT STRIKE HAZARD

Bird-aircraft strikes are a consideration for flight safety and can result in damage to the aircraft and harm to the aircrew. More than 95 percent of the strikes occur below 3,000 feet AGL, and more than half of all bird encounters occur at aircraft take-off and landing sites. Migration corridors and other areas where birds congregate present the greatest risks (USAF, 2000e). The design and construction of any facility in the vicinity of the airfield must comply with certain restrictions under the bird-aircraft strike hazard (BASH) plan. For instance, covering open water areas and keeping grassed areas cut to a regulation height discourage bird foraging activities.

Waterfowl and raptor species make up 60 percent of all known avian intercepts. Weather, airport surroundings, and the proximity of aircraft flight paths to migratory routes, nesting areas, and stopover regions are all factors in bird strike rates. The Air Force has developed a Bird Avoidance Model (BAM) that aircrews must use to help in defining altitudes and locations to avoid along MTRs. Use of this model has minimized bird-aircraft strikes (USAF, 1997).

4.3.1 Proposed Action

Bird-aircraft strike hazards within the ROI at Hurlburt Field are a low probability event. Aircraft testing and training occur away from wildlife management areas, and Hurlburt is situated between migratory bird routes. Also, it is not a major stopover area for migrating birds (USAF, 1997). Established MTRs, LATNs, and outlying landing fields would be used under the Proposed Action, and there is a BASH plan in place.

Under the proposed action, the change in airfield operations from the MH-53 and MH-60 to the CV-22 would lead to essentially no change in the amount of bird-aircraft strikes. In addition, no aspect of the Proposed Action would create or enhance locales attractive to concentrations of birds, nor would the current flight tracks at the base change; therefore, no impacts to bird-strike hazards would occur at Hurlburt Field.

4.3.2 No Action Alternative

Hurlburt Field would continue efforts to reduce bird-aircraft strikes through implementation of its BASH 91-212 Plan; therefore, no significant impacts to bird-strike hazards at Hurlburt Field would occur under the No Action Alternative (USAF, 2000h).

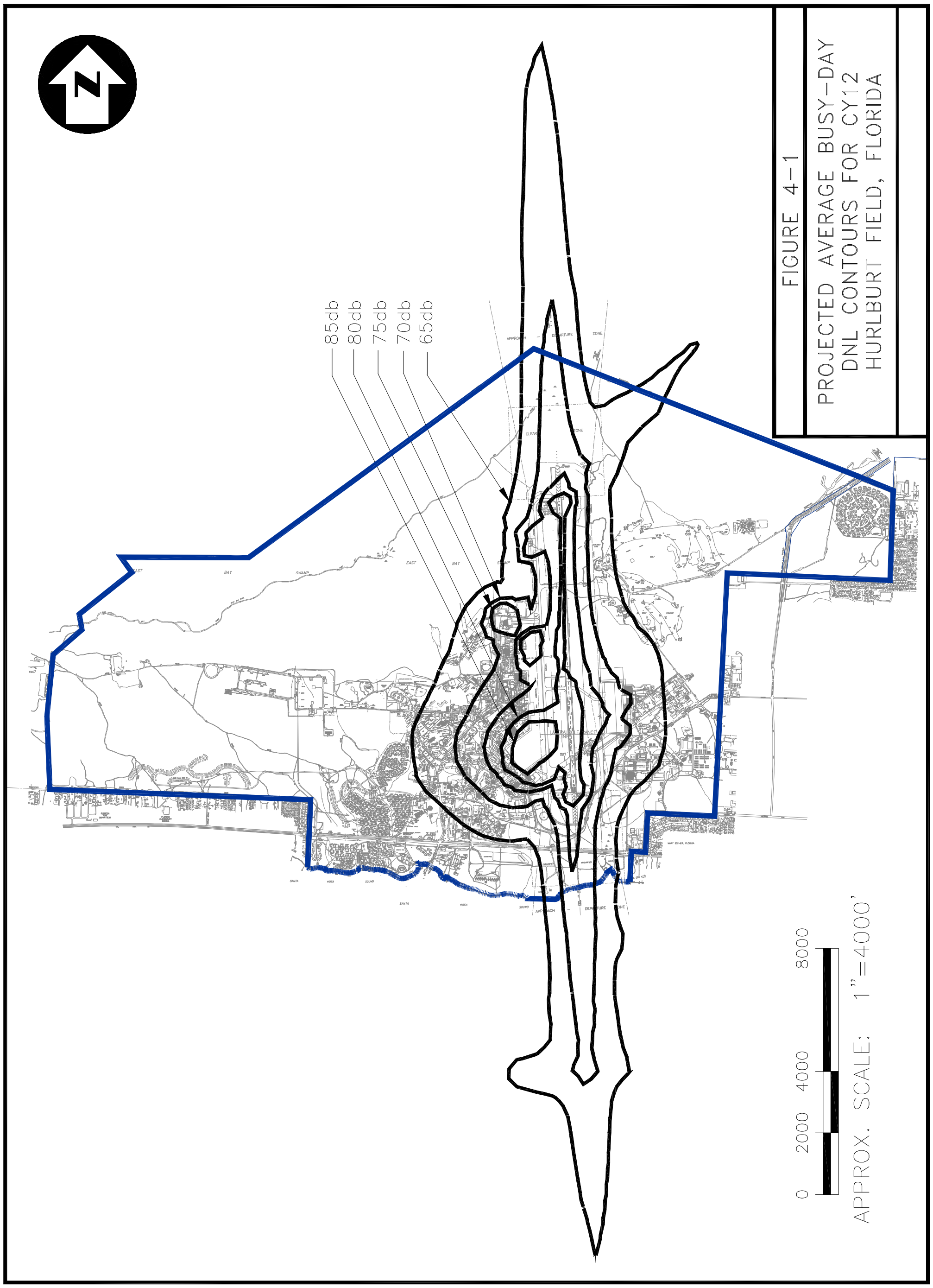
4.4 NOISE

4.4.1 Proposed Action

Hurlburt Field

Figure 4-1 shows projected CY12 average busy-day DNL contours. The CY12 DNL contours extend in the direction of the most used typical flight tracks. The DNL 65-70 dB contour is smaller by approximately 22 percent (765 acres). This is due in large to the reduction in total annual airfield operations and the lower number of operations of the CV-22 aircraft versus the MH-53J helicopters. In addition, the effect of the 250 night MH-53J touch & go events has been removed in CY12, thus the reduction in the DNL 65 dB contour east of the field. C-130 aircraft maximum power ground run-ups remains the main contributor to the overall run-up effect on the contours. Contours of DNL 75 dB and above remain within the base boundary for CY12.

In the vicinity of Hurlburt Field, noise levels would be expected to increase to a DNL of 65 dB along aircraft flight paths west over the water to Navarre Bridge



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and northeast in the Eglin Range Complex to Crestview. These contours, however, remain over compatible land (water and the Eglin Range Complex) and are not shown in this analysis.

Table 4.4-1 shows the impacts of CY12 aircraft operations at Hurlburt Field in terms of estimated acreage, dwellings, and population within contours at 5-dB increments. The population data were obtained from the U.S. Census Bureau's 1990 census. The DNL 65-70 dB contour associated with CY12 operations would contain an estimated 424 acres in off-base land area, 25 dwelling units, and a population of 78. This is a decrease of 18 percent (95 acres) in off-base land area and 77 percent (268 people) in population numbers. The computed contour areas exclude bodies of water and the area of Hurlburt Field itself.

Table 4.4-1. CY12 Estimated Off-Station Land Acres, Dwelling Units and Population within Noise Exposure Contours at Hurlburt Field

DNL Band	Item	CY 1999 Value	CY 2012 Value	Difference
65-70 dB	Acres	519	424	-95
	Dwelling Units	135	25	-110
	Population	346	78	-268
70-75 dB	Acres	79	50	-29
	Dwelling Units	24	18	-6
	Population	68	50	-18
75-80 dB	Acres	1.5	0	-1.5
	Dwelling Units	8	0	-8
	Population	23	0	-23
80+ dB	Acres	0	0	0
	Dwelling Units	0	0	0
	Population	0	0	0

Based on a comparison of CY99 and CY12 contours and on the information contained in Table 4.4-1, off-base land area, dwellings, and population impacted within the DNL 65-75 dB contour area would decrease by 36 percent (29 acres), 25 percent (6 units) and 26 percent (18 people), respectively.

AIRSPACE

The noise levels for CY12, as calculated directly under the MTR centerline, would not be expected to exceed an average L_{dnmr} of 51 dB.

The noise level on SR-119 is not projected to increase by more than an average L_{dnmr} of 1 dB for the whole route from CY99 conditions. Although noise levels on any one segment may increase slightly, all of the levels are projected to be within those normally acceptable for residential land use. Table 4.4-2 shows the CY12 average noise exposure levels within each airspace components.

Table 4.4-2. CY12 Maximum L_{dnmr} within Restricted Areas, Target Areas and Landing Zones

Airspace Components	CY 1999 Average L_{dnmr} (dB) within Airspace	CY 2012 Average L_{dnmr} (dB) within Airspace
R-2915A	59	60
R-2915B	61	61
R-2914A	54	54
R-2919A	59	59
A-77	75	74
A-78	75	74
C-52N	<50	55
Army Ranger Camp-Runway Environment	56	56
Army Ranger Camp-Pattern Environment	<50	<50

In R-2915A, the average L_{dnmr} value increased approximately 1 dB. This is due to CV-22 aircraft conducting more sorties in CY 2012 than MH-53J helicopters under CY99 conditions. In all other airspace, the average L_{dnmr} levels remained unchanged due to the fact that neither the MH-53J helicopters nor the CV-22 aircraft are significant contributors to noise levels within the airspace analyzed. The L_{dnmr} values associated with Target Areas A-77 and A-78 would be expected to decrease approximately 1 dB. This decrease is due to the lower number of CV-22 sorties, as well as a shorter average mission duration. For Target Area C-52N, the average L_{dnmr} would be expected to increase approximately to 56 dB due to CV-22's larger number of sorties in that airspace unit (8 MH-53J sorties for CY99 versus 60 CV-22 sorties for CY12). For the Army Ranger Camp, no noticeable increase would be expected. The noise levels associated with CY12 operations in all airspace areas discussed in this analysis would be expected to remain generally within 1 dB of CY99 noise levels and thus would not be expected to significantly impact the environment.

4.4.2 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented. The noise impact at Hurlburt Field and the airspace components discussed in this analysis would remain as described for CY99 conditions.

4.4.3 Cumulative Noise Impacts

A cumulative impact is defined as the impact on the environment that could result from the implementation of the Proposed Action added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions that take place over time. This section discusses cumulative impacts limited to airfield and airspace discussed in this analysis.

Hurlburt Field

No cumulative noise impacts would be anticipated under the Proposed Action. No significant environmental noise impacts would be anticipated in terms of impacted population, dwelling units, or land areas. The introduction of the CV-22 Osprey is mitigated in great part by the relocation of two flying squadrons (the 55th SOS and the 8th SOS) and the retirement of the MH-53J Pave Low III helicopters from the 20th SOS.

No environmentally significant cumulative noise impacts would be anticipated for CY12 operations analyzed on SR-119. Noise levels on SR-119 would be expected to remain well below an average L_{dnmr} of 65 dB, which is considered compatible with residential uses.

No environmentally significant cumulative noise impacts would be anticipated for CY12 operations analyzed in Restricted Areas R-2915A, R-2915B, R-2914A, and R-2919A. Noise levels in these airspace units would be expected to remain with 1 dB of CY99 conditions. This applies also to Target Area C-52N and the Army Ranger Camp. For Target Areas A-77 and A-78, the introduction of the CV-22 with a shorter mission duration and lower number of sorties would be expected to result in a reduction of noise levels by approximately 1 dB to an average L_{dnmr} value of 74 dB.

4.5 WASTES, HAZARDOUS MATERIAL, STORED FUEL AND HAZARDOUS WASTE MANAGEMENT

The following section evaluates the impacts to solid waste management, and hazardous material and waste management with regard to the Proposed Action and the Alternative Action.

4.5.1 Proposed Action

The CV-22 Osprey would be one of the most environmentally friendly aircraft in the current DoD aircraft inventory. Pollution prevention has been an integral part of the aircraft design. Program contracts have required eliminating or reducing a significant number of hazardous substances used in the construction and maintenance of the aircraft (USMC, 1999). Therefore, replacement of the MH-53 and MH-60 with the CV-22 would not increase the overall estimated use hazardous substances associated with aircraft maintenance.

Since the CV-22 is a new aircraft, limited data is available. However, no unusual chemicals or maintenance procedures would be used as compared with the MH-53 and MH-60. Therefore, the beddown of the CV-22 at Hurlburt Field would not increase annual hazardous waste production. Hurlburt Field would still be considered by USEPA to be a large-quantity hazardous waste generator.

Buildings 91262 and 91266, where electrical system and door improvements are planned, are satellite waste accumulation points. Building 91262 handles paint chips, dust, paint-related material, alodine rags, brushes, and paper cups. Building 91266 handles spill pads, oil, hydraulic fluid, and jet fuel. Building 91029 has a 1,000-gallon oil/water separator associated with it. There would be no change in the procedure used to handle hazardous waste associated with the Proposed Action.

None of the proposed ground-based improvements would take place in or around known Installation Restoration Program (IRP) Sites.

Under the Proposed Action, hazardous materials associated with the beddown of the CV-22 aircraft at Hurlburt Field would include solvents, jet fuel, oil, paints, and sealants. These materials would be similar to materials currently used by other aircraft at Hurlburt Field. There would be no change in the procedures used to manage hazardous materials. Safety procedures described in the Hurlburt Field SPCC would be adhered to. Should an accidental release or spill of hazardous substances occur, procedures within the SPCC would be followed to minimize impacts.

The Proposed Action would include the upgrading of the electrical systems and doors of two buildings, 91262 and 91266, the demolition of Building 91025, and the extensive renovation of Building 91029. There would be a temporary increase in the generation of solid waste during the demolition and renovation of the buildings associated with the Proposed Action. The Springhill Landfill and the landfills in Navarre and Crestview used for construction and demolition debris have sufficient capacity to handle the increased output.

The base requires that all buildings to be altered must be tested for asbestos-containing material (ACM). Testing would be completed for all buildings associated with the Proposed Action prior to construction and/or demolition to ensure that the potential for worker contact with ACM has been eliminated. If ACM were encountered, appropriate safety measures would be taken by the Air Force to minimize potential threats to human health. Asbestos abatement would be conducted in accordance with the Toxic Substances Control Act, so no threats to human health would occur.

According to Bioenvironmental Engineering, buildings constructed after 1985 are exempt from testing and assumed to be lead-based paint (LBP) free. Real estate records show that all of the buildings associated with the Proposed Action, Buildings 91025, 91029, 91262, and 91266, were constructed after 1985. Therefore, testing for LBP would not be required.

Hazardous wastes and materials such as paint, adhesives, and solvents would be used during the construction phase of the Proposed Action. All hazardous wastes and materials would be temporarily stored and disposed of per base procedures. All construction-related hazardous wastes and materials, including petroleum products, would be removed and disposed of according to base procedures, following the completion of tasks. There would be no expected net increase in solid waste generation during the operation of the Proposed Action.

4.5.2 No Action Alternative

Hurlburt Field currently accommodates other flights and training unrelated to the CV-22. The activities associated with these programs have environmental consequences that are included in the baseline conditions described in Section 3.2.6. Under the No Action Alternative, the proposed beddown of the CV-22 Osprey aircraft, the renovation of two hangars and Building 91029 and the demolition of Building 91025 would not occur. Consequently, implementation of the No Action Alternative would not change current activities associated with approved activities at Hurlburt Field, and would not produce any new impacts to hazardous materials and waste management.

4.6 WATER RESOURCES

The evaluation of potential impacts to water resources considers the potential effects of implementing the Proposed Action or No Action Alternative on water quality and on the hydrologic characteristics of Hurlburt Field.

4.6.1 Proposed Action

Implementation of the Proposed Action potentially would result in a temporary increase in runoff and in total suspended particles (TSP) in nearby surface waters as the result of the site grading that would occur with the demolition of Building 91025 and the three-story renovation to Building 91029. However, implementation of standard erosion control measures and best management practices (BMPs) into the project design and construction would minimize runoff and sediment loading into nearby surface waters. Impacts would be temporary during renovation and demolition. No additional impervious surfaces would be constructed; therefore, no impacts to the base stormwater systems would occur.

Groundwater would not be adversely affected during the beddown of the CV-22 and the proposed renovations and demolition. In the Floridan aquifer, ground disturbances would not reach the depths that would affect groundwater resources. The shallow sand and gravel aquifer near the site is estimated to be between 2 and 15 feet below ground surface. Site grading, installation of pipes, conduits, culverts, or footings may reach the aquifer. Groundwater pumping could be necessary depending on the technology used, the exact locations, and the type of work to be done. It may be possible to employ horizontal boring techniques as opposed to trenching to facilitate some of the necessary site preparations.

Personnel numbers at Hurlburt Field would not increase as a result of the implementation of the Proposed Action. Therefore, the beddown of the CV-22 Osprey would not increase the amount of groundwater currently being pumped by the base from the Floridan aquifer. The buildings proposed for renovations and construction are currently using the existing wastewater and potable water systems at Hurlburt Field, and no changes are planned. No impacts to groundwater resources would occur as a result of the implementation of the Proposed Action.

The buildings affected by the Proposed Action: 91262, 91266, 91025, and 91029 are not located in the 100-year floodplain. Therefore, the proposed improvements, renovation, demolition, and the beddown of the CV-22 would have no impact on the floodplain on Hurlburt Field.

4.6.2 No Action Alternative

Under the No Action Alternative, the proposed beddown of the CV-22, and the associated ground-based construction activities at Hurlburt Field would not occur. Consequently, baseline conditions, as described in Section 3.2.7 would remain unchanged. Implementation of the No Action Alternative would not change current activities; therefore, no impacts to water resources would occur.

4.7 BIOLOGICAL RESOURCES

This section analyzes the potential for impacts to biological resources from the implementation of the Proposed Action or No Action Alternative. Impacts potentially could result from the projected changes in aircraft operations at the base and in airspace. Analyses of impacts on base focus on whether and how ground disturbing activities and changes in airfield operations may affect biological resources. For airspace, the analysis emphasizes those wildlife resources that might be affected by projected changes in airspace use.

4.7.1 Proposed Action

The ground-based activities associated with the Proposed Action would not require the removal of any landscape vegetation near Building 91262 and 91266. The hangars are located in the aircraft operations and maintenance land use section of the base. Landscaping near Buildings 91029 and 91025 would be impacted by renovation and demolition activities. There is no sensitive vegetation around the proposed sites, and the new addition would be landscaped after construction is complete. Also, there are no jurisdictional wetlands adjacent to Buildings 91025 or 91029. There are wetlands to the north of Hangars 91266 and 91262; however, only interior renovations are planned for these facilities. No impacts to wetlands would occur as a result of the Proposed Action. The ground-based construction and renovation portion of the Proposed Action would have no impacts on wildlife, as the sites are in the industrial land use section of the base.

The potential for loud noises exists along the MTRs and LATN to disturb wildlife and their behavior. It has been shown that birds become accustomed to frequent low altitude overflights, but there may be adverse effects to wildlife in areas unaccustomed to such noise. Displaced birds usually return rapidly to breed or roost following disturbances. It has been shown that raptors do not abandon favored breeding grounds as a consequence of intensive aircraft activity. When startled from their nests, they usually return within a minute (USAF, 2000e). The CV-22 Osprey produces 50.2 dB of noise compared to 48.9 dB from the MH-53. Because the increase in noise levels would be below the threshold of 65 dBa, the impact to wildlife along the MTRs and LATN would be insignificant.

A study of the effects of JP-8 on wildlife shows some liver, renal, neurological, and pulmonary toxicological effects may occur. There was no evidence of a mutagenic risk. Acute toxicity data of JP-8 on wildlife is limited. However, data suggest that direct exposure is relatively non-toxic meaning non-irritating to eyes and produces slight skin irritation. The use of the Fuel Jettisoning Simulation Model (FJSIM) developed by the USAF is recommended for use in determining sufficient altitudes for fuel jettison scenarios. The FJSIM measures fuel evaporation, meteorological effects, aircraft configurations, fuel flow rates, airspeeds, and aircraft wake effects. Fuel is never released at altitudes below 3,000 feet except during an extreme in-flight emergency, and fuel is seldom released over land (USAF, 1997).

Under the Proposed Action, vegetation within the MTRs and LATN areas would not be negatively affected. Even though the CV-22 generates higher downward windspeeds during takeoff and landings than the MH-53 or MH-60, no new impacts are expected on Hurlburt Field (USAF, 2000e). The runways are currently in use by other aircraft and are paved and devoid of vegetation.

4.7.2 No Action Alternative

Hurlburt Field currently accommodates other flights and training unrelated to the CV-22. The activities associated with these programs have environmental consequences that are included in the Baseline conditions described in Section 3.2.8.

There is a potential for loud noises along the MTRs and LATN to disturb wildlife and their behavior. Birds can be driven from nests, reproduction rate can be lowered, and wading birds may panic and exhibit fright/flight behavior. The degree of impact depends on each species' sensitivity to noise. Studies have shown that F-16 training in Florida that occurs at less than 500 feet AGL had no effect on the establishment, size and reproduction success of wading bird colonies. The birds became accustomed to the frequent low altitude overflights. There was no startle response in flight between 500 and 2,000 feet AGL. Wildlife may experience adverse effects from frequent overflights in areas unaccustomed to such noise (USAF, 1997).

A study of the effects of JP-8 on wildlife shows some liver, renal, neurological, and pulmonary toxicological effects may occur. There was no evidence of a mutagenic risk. Acute toxicity data of JP-8 on wildlife is limited. However, data suggest that direct exposure is relatively non-toxic meaning non-irritating to eyes and produces slight skin irritation. The use of the Fuel Jettisoning Simulation Model (FJSIM) developed by the USAF is recommended for use in determining sufficient altitudes for fuel jettison scenarios. The FJSIM measures fuel evaporation, meteorological effects, aircraft configurations, fuel flow rates, airspeeds, and aircraft wake effects. Fuel is never released at altitudes below 3,000 feet, except during an extreme in-flight emergency, and seldom is released over land (USAF, 1997).

Under the No Action Alternative, the proposed beddown of the CV-22 aircraft, the renovation of two hangars and Building 91029 and the demolition of Building 91025 would not occur. Consequently, implementation of the No Action Alternative would not change current activities associated with approved activities at Hurlburt Field and would not produce any impacts to biological resources.

4.8 GEOLOGY AND SOILS

4.8.1 Proposed Action

Soils exposed during demolition and construction activities at Building 91025 and 91029 are subject to erosion. These impacts would occur during site grading and trenching. Measures such as applying water or barriers to restrict erosion of exposed soils would be used. Implementation of a sediment and erosion control plan as well as BMPs would reduce the impact. The impacts to soils would be minimal and temporary. Construction activities associated with the beddown of the CV-22 Osprey at Hurlburt Field would not affect the underlying geological structure of the area. There are no plans to disturb the soils during the renovations of Building 91262 and 91266; therefore, no impacts would occur.

Aircraft operations in airspace would not be considered a source of impact to the geology and soil resources and are not evaluated for the routes where aircraft fly over land. However, the stronger downdrafts caused by the double rotor CV-22 at landing sites could cause a slight increase in soil erosion. Since the landing sites consist of paved surfaces, no significant impacts are expected.

4.8.2 No Action Alternative

Under the No Action Alternative, the proposed beddown of the CV-22 aircraft, the renovation of two hangars (91262 and 91266) and Building 91029 and the demolition of Building 91025 would not occur. Consequently, implementation of the No Action Alternative would not change current conditions and would not produce any impacts.

4.9 CULTURAL RESOURCES

4.9.1 Proposed Action

The Proposed Action involves modifications to several buildings at Hurlburt Field, the construction of CV-22 parking areas, and training flights over five southeastern states.

As part of previous cultural resource surveys, the sites containing Buildings 91029, 91262, and 91266 were surveyed. No archeological resources that would make these sites eligible for listing on the NHRP were found.

The CV-22 parking area is located on the site of an existing parking area for the helicopters, and has already been disturbed. Furthermore, the parking area is located in a “Low Probability Zone” for archaeological resources, according to the *Cultural Resources Management Plan for Hurlburt Field,* March, 1996.

State Historic Preservation Officers (SHPO’s) for the five states affected by overflights (Alabama, Florida, Georgia, Tennessee, and North Carolina) were contacted to determine if there was potential for overflight impacts on cultural resources in their state. Based on the responses of the SHPOs, impacts to cultural resources are not anticipated in those states due to the Proposed Action. However, the state of North Carolina postponed comment until after the Environmental Assessment was reviewed (see Appendix E).

Based on these findings, the Proposed Action should not have a significant impact on cultural resources at Hurlburt Field or in the overflight areas of the military training routes.

4.9.2 No Action Alternative

Under the No Action Alternative, the proposed beddown of the CV-22 aircraft and the construction and demolition associated with the Proposed Action would not occur. Consequently, baseline conditions as discussed in Section 3.2.10 would remain unchanged. The overflights of the five states involved in training missions would remain the same. Therefore, no new impacts would occur under the No Action Alternative.

4.10 LAND USE

4.10.1 Proposed Action

Off-Base Land Use

The Proposed Action should have no effect on the off base land use in the area near Hurlburt Field. The buildings that would be reconstructed and modified are more than one-half mile from the eastern boundary of the base and approximately one and one-half miles from the most densely populated section of this area. Although building 91029 would require a three-story renovation, it is in the vicinity of other tall buildings and would not impact the aesthetic quality of the view from the residential areas in Mary Esther near the base boundary. The modifications to the hangar doors also would have no aesthetic impact on the off base land use. The parking facilities for the CV-22 aircraft would be located approximately 0.75 miles from the eastern boundary of the base. This also would have no effect on off base land use in the area.

Sorties conducted by the CV-22s would utilize runway 18/36. Due to the prevailing winds in the area, approximately 60 percent of the CV-22 take-offs are expected to utilize runway 36, which would position the aircraft over unoccupied sections of Eglin AFB. Furthermore, the Proposed Action includes fewer sorties than the baseline condition and the aircraft noise is expected to decrease. The training missions undertaken by the CV-22s generally fly over rural and mountainous areas where the land use is very low density. Noise emissions during training missions are projected to remain essentially the same as baseline conditions, with the exception of R2915A, where noise levels under the Proposed Action would increase by 1 dB. However, noise levels would only be 60 dB, which is considered to be an acceptable noise level (see Section 4.4.1). Therefore, the aircraft operations under the Proposed Action would have no impact on off-base land use.

On Base Land Use

The storm surge from a Category 5 hurricane would not impact the reconstructed buildings. The closest building to the storm surge would be the Training Device Support Facility, and it would be several thousand feet inland from the Category 5 storm surge. The buildings that would be reconstructed are in areas that are either existing or planned Aircraft Operations and Maintenance designated land use categories and are compatible with surrounding land uses. The CV-22 parking pads are located in an area designated as Aircraft Runway/Taxiway and are compatible land uses. The Proposed Action would not impact on base land uses.

4.10.2 No Action Alternative

Under the No Action Alternative, the buildings on Hurlburt Field would remain unchanged. The MH-53 helicopters would not be retired; the CV-22 Osprey would not be fielded; and aircraft operations would remain the same. Therefore, there would be no impacts to off base or on base land uses under the No Action Alternative.

4.11 ENVIRONMENTAL JUSTICE

4.11.1 Proposed Action

The Proposed Action involves modifications to several buildings at Hurlburt Field and training flights over five southeastern states. Overall aircraft operations at Hurlburt are projected to decrease, and the noise associated with the takeoffs and landings is also expected to decrease. The census tract containing a concentration of minorities and persons living in poverty status is located near the eastern boundary of Hurlburt Field. The distance from the airstrip to the edge of the census tract is over one mile and the distance from the airstrip to the most densely populated portion of the census tract is over two miles. The majority of the take offs, 60 percent, would be over Eglin AFB to the north, based on prevailing wind patterns. The remaining take offs and 60 percent of the landings would occur over Santa Rosa Sound and the Gulf of Mexico to the south.

During training activities on the military training routes, the noise levels at the overflight areas with the Proposed Action is projected to remain essentially the same as baseline conditions. However, noise along R2915A would increase from a baseline of 59 decibels to 60 decibels under the Proposed Action. This noise increase is insignificant, and decibel levels under the Proposed Action are below unacceptable noise levels (See Section 4.4.1.2).

4.11.2 No Action Alternative

Under the No Action Alternative, the proposed beddown of the CV-22 aircraft and the construction and demolition associated with the Proposed Action would not occur. Consequently, baseline conditions as discussed in Section 3.2.12 would remain unchanged. The overflights of the five states involved in training missions would remain the same. Therefore, no new impacts would occur under the No Action Alternative.

4.12 INDIRECT AND CUMULATIVE IMPACTS

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from the "incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR 1508.7).

Cumulative effects are most likely to arise when a relationship or synergism exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in close proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide in time would offer higher potential for cumulative effects.

The Proposed Action would affect the area in the vicinity of the airfield and the areas underlying the airspace used for the MTRs and LATN areas. In the vicinity of the airfield, the impacts would be construction related and those associated with aircraft noise. Other construction related projects on base that would occur at the same time as the Proposed Action include Defense Access

Road: Realign/Relocate Lovejoy Road/East Gate, Wetland Dredge and Fill, Runway Resurfacing (completed), and Hot Cargo Addition. The key issue involves short-term noise effects. No other resource areas were found to have any measured effect resulting from the implementation of the Proposed Action. The incremental contribution of impacts of the Proposed Action would be negligible.

There are no direct, indirect, or cumulative impacts associated with the construction and operation of the flight simulator or the beddown of the CV-22 Osprey aircraft at Hurlburt Field. The airspace along the MTRs and LATN areas would experience no new cumulative effects since the CV-22 is, in effect, replacing other aircraft that currently use the same routes.

None of the projected impacts associated with the Proposed Action and No-Action alternative are significant in themselves. At this time, there are no known existing actions or current future proposals from which a significant cumulative impact in the ROI would result when combined with the effects of the proposed beddown of the CV-22 at Hurlburt Field.

4.13 UNAVOIDABLE ADVERSE IMPACTS

There are no significant unavoidable adverse impacts associated with the beddown of the CV-22 aircraft at Hurlburt Field.

4.14 RELATIONSHIP BETWEEN SHORT-TERM USES AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Implementation of the Proposed Action would have a positive effect on long-term productivity by providing the Air Force with effective means of quickly inserting and extracting personnel and/or sensitive equipment from hostile areas. The extraction of special operations forces (SOF) from behind enemy lines or contested airspace is the US Commander in Chief Special Operation Command's (USCINCSOC) number one priority and a SOF capability shortfall. AFSOCs current system lacks the capability to meet the demand of missions of eight or more hours and 1,000 or more miles in range. With the beddown and deployment of the CV-22 Osprey at Hurlburt Field, those demands would be met.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analyses include identification of "…any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action should it be implemented." For the Proposed Action, most impacts are short-term and temporary, or long-lasting, but not significant. Renovation and construction of on base facilities would require the consumption of limited amounts of materials typically associated with interior renovations (e.g., wiring, insulation, and doors) and construction (e.g. concrete, sand, bricks, and steel). An undetermined amount of energy to conduct renovations, construction, and operation of these facilities would be expended and irreversibly lost. Both the Proposed Action and the No Action Alternative would require fuels used by aircraft and surface vehicles. Since flight activities, aircraft maintenance, and operations would not increase relative to baseline, total fuel consumption would not increase. Implementation of the Proposed Action would not result in the destruction of environmental resources. No wildlife habitat or cultural resources at Hurlburt Field or under the airspace proposed for use by the CV-22 Osprey would be lost or adversely affected as a result of implementation of the Proposed Action.

SECTION 5.0

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SECTION 6.0

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SECTION 8.0
ACRONYM LIST

°F	Degrees Fahrenheit
ACM	Asbestos containing material
AFB	Air Force Base
AFI	Air Force Instruction
AFSOC	Air Force Special Operations Command
AGE	Aerospace Ground Equipment
AGL	Above Ground Level
APZ	Accident Potential Zones
AQCR	Air Quality Control Region
ARTCC	Air Route Traffic Control Center
ASR	Airport Surveillance Radar
AST	Aboveground storage tank
ATC	Air Traffic Control
BASH	Bird/Aircraft Strike Hazard
BMPs	Best Management Practices
BX	Base Exchange
CAA	Clean Air Act
CCCL	Coastal Construction Control Line
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CES	Civil Engineering Section
CFR	Code of Federal Regulations
CINC	Commander in Chief
CO	Carbon monoxide
CP	Charlie
CWA	Clean Water Act
CY	Calendar Year
dB	Decibel
dBA	Decibel, A-weighted
DEP	Department of Environmental Protection
DNL	Decibel, night level
DoD	Department of Defense
DoN	Department of Navy
DoT	Department of Transportation
DOT	Directorate of Training
DP	Delta
DRMO	Defense Reutilization and Marketing
EA	Environmental Assessment
ECM	Electronic Countermeasures

EIS	Environmental Impact Statement
EMD	Engineering and Manufacturing Development
EO	Executive Order
EPCRA	Emergency Planning and Community Right To Know Act
FAA	Federal Aviation Authority
FARS	Federal Aviation Regulations
FCF	Function Check Flight
FCMP	Florida Coastal Management Program
FIP	Federal Implementation Plan
FJSIM	Fuel Jettisoning Simulation Model
FLIR	Forward Looking Infrared
FNAI	Florida Natural Areas Inventory
FOB	Forward Operating Base
FOL	Forward Operating Location
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCA	Ground Controlled Approach
GIS	Geographic Information System
Gpm	Gallons per Minute
HF	Hurlburt Field
HF	Hurlburt Field
HQ	Headquarters
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IPT	Integrated Product Teams
IR	Infrared
IR	Instrument Flight Routes
IRAT	Independent Risk Assessment Team
IRP	Installation Restoration Program
Kgs	Kilograms
KTAS	Knots True Air Speed
LATN	Low Altitude Tactical Navigation
L_{AE}	Sound Exposure Level
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-rate Adjusted Monthly Day-Night Average Sound Level
L_{dnr}	Onset-rate Adjusted Day-Night Average Sound Level
LBP	Lead-based paint
Lbs	Pounds
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LPD	Landing Platform Dock
LPH	Landing Platform Helicopter
LTO	Landing Take-off
MEK	Methyl Ethyl Ketone

Mg	Milligrams
mgd	Millions of gallons per day
MOA	Military Operations Area
MOB	Main Operating Base
MRC	Major Regional Contingency
MSL	Mean sea level
MTR	Military Training Routes
NAAQS	National Ambient Air Quality Standards
NBC	Nuclear, Biological and Chemical
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	Nautical Miles
NM	Nautical Miles
NO_2	Nitrogen dioxide
NO_X	Nitrogen oxides
NRHP	National Register of Historic Places
NVG	Night Vision Goggles
O_3	Ozone
ODS	Ozone Depleting Substances
OSHA	Occupational Safety and Health Act
Pb	Lead
PEOA	Program Executive Officer – Air
PM_{10}	Particulate matter with an aerodynamic diameter less then or equal to 10 microns
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less then or equal to 2.5 microns
PPM	Parts per million
PSI	Pounds per Square Inch
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SEL_r	On-set Rated Adjusted Sound Exposure Level
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur dioxide
SOS	Special Operations Squadron
SOW	Special Operations Wing
SOW	Special Operations Wing
SO_X	Sulfur oxides
SPCC	Spill Prevention, Control and Countermeasures
SR	Slow Speed Low Altitude Training Routes
STF	Summary Tape File
STO	Short Takeoff
TACAN	Tactical Air Navigation
TCA	Trichloroethane
TDSF	Training Device Support Facility

TGO	Touch and Go
Tiger	Topographically Integrated Geographic Encoding and Referencing
Tpy	Tons per year
TRACON	Terminal Radar Approach
TSCA	Toxic Substance Control Act
TSP	Total Suspended Particulates
U.S.	United States
USAF	United States Air Force
USC	United States Code
USDoA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
USSOCOM	United States Special Operations Command
UST	Underground storage tank
VFR	Visual Flight Rules
VOC	Volatile organic compound
VR	Visual Flight Routes
VTOL	Vertical Takeoff and Landing
μ	Microns
$\mu g/m^3$	Micrograms per cubic meter

APPENDIX A

SUPPLEMENTAL DESIGN AND OPERATIONAL INFORMATION ON THE CV-22 OSPREY

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APPENDIX A
SUPPLEMENTAL DESIGN AND OPERATIONAL INFORMATION ON THE CV-22 OSPREY

BACKGROUND/THREAT:

The CV-22 will provide United States Special Operations Command (USSOCOM) with a multi-engine, dual-piloted, self-deployable, medium lift, Vertical Takeoff and Landing (VTOL) aircraft capable of penetrating politically or militarily denied areas, using terrain following/terrain avoidance radar for the purpose of infiltration, exfiltration, or resupply, as outlined in the Air Force Special Operations Command's (AFSOC) Provide Mobility of Forces in Denied Territory Mission Area Plan (MAP), Second Edition, dated 31 January 1994. The aircraft will be fully capable of operations in adverse weather; day or night; in climates from arctic to tropical; and in a variety of conventional, unconventional and contingency combat situations including Nuclear, Biological, and Chemical (NBC) warfare conditions.

The CV-22 is expected to operate in both global and regional conflicts throughout the military continuum from peacetime engagements to conventional, high-intensity, general warfare. The CV-22 will encounter threats ranging from small arms and shoulder-fired surface-to-air missiles to anti-aircraft artillery, high performance fixed wing aircraft, lasers, and integrated air defense systems. Communications will be threatened by regional collection and jamming capabilities over a variety of frequencies. The most severe threat to CV-22 will be a combination of these diverse systems, with the degree of severity being mission scenario dependent.

MISSION:

The primary mission of the CV-22 is to support all nine principal missions of Special Operations (Direct Action, Special Reconnaissance, Foreign Internal Defense, Unconventional Warfare, Combatting Terrorism, Counter Proliferation, Civil Affairs, Psychological Operations, and Information Operations); collateral Special Operations activities (Coalition Support, Security Assistance, Humanitarian Assistance, Anti-terrorism, Combat Search and Rescue, Humanitarian Demining, Peace Operations, and Counter-drug); and the high risk/high payoff missions governed by Executive Order 12333 (Special Activities). The aircraft will be capable of low-visibility, clandestine penetration of medium to high threat environments employing robust self defensive avionics and secure, anti-jam, redundant communications compatible with current and planned systems used by command and control agencies and ground forces. To the maximum extent possible, it will self-deploy worldwide without aerial refueling in order to maximize mission security and have an unrefueled combat range sufficient to satisfy current and emergent Major Regional Contingency (MRC) scenarios as well as national mission taskings. The CV-22 will possess the speed sufficient to complete most national mission taskings within one period of darkness and the ability to operate from air capable ships without reconfiguration or modification.

Technical:

The following paragraphs briefly discuss program technical risk, and the measures being taken to effectively manage them.

- Weight reduction. During EMD, the V-22 conducted a successful weight reduction program. Weight requirements and “challenges” have been allocated to individual integrated product teams (IPTs), and formal design studies have been conducted to identify and implement appropriate weight reduction initiatives. As of September 2000, CV-22 design empty weight was 34,825 lb. with a current status weight of 34,930 lb., and a projected growth weight of 35,039 lb. The current projected empty weight for the MV-22 is 33,142 lb.

- Producibility. The V-22 EMD design process was performed with a strong emphasis on producibility. In most cases, producibility improvements also resulted in cost savings and/or weight reduction. When there was a conflict, careful consideration was given to producibility initiatives to facilitate a smooth transition from EMD to production. Some V-22 producibility initiatives included part count reduction, automated composite manufacturing techniques, and a smooth transition from EMD to production by use of production tools and processes established during EMD.

- Software development and integration. An independent risk assessment team (IRAT) was chartered by DON Program Executive Officer-Air [PEO (A)] to identify avionics and software related risk areas, and to provide appropriate recommendations to the V-22 program manager. Based upon the IRAT findings, a software safety review team was also chartered to evaluate the V-22 software engineering management system and provide recommendations to Bell-Boeing and PMA275. Neither of these reviews resulted in the identification of any high-risk areas, but they did result in some very good recommendations, which have been implemented regarding documentation, manpower, and related software engineering process issues.

- Configuration definition. The baseline MV-22 configuration has moved from EMD to low rate initial production (LRIP). The first three LRIP Lots aircraft, 19 MV-22s, will have been delivered to the Marine Corps by the end of FY01. With the completion of CV-22 SRR, PDR, and CDR, configuration definition was finalized and incorporated on CV-22 EMD aircraft 9 at Bell Plant 6, Arlington, TX. The CV-22 EMD aircraft entered Developmental Testing/Operational Testing (DT/OT) at Edwards AFB, CA on 18 Aug 00. The MMR and range extension tank risk reduction aircraft, number 7, also completed modification at Bell Plant 6 and joined the CV-22 EMD aircraft at Edwards AFB on 20 Nov 00. Additional CV-22 configuration design efforts are on going in support of follow-on P³I requirements development. As of Sep 00, there are a limited number of ongoing design activities related to affordability, weight reduction, and producibility initiatives. A Physical Configuration Audit (PCA) is being conducted on aircraft number 14 to establish the product baseline configuration for full rated production.

The table below highlights CDR identified program risks for the CV-22 configuration.

CV-22 High and Moderate Program Risks

Description	Risk
Weight	Mod
Flight Test Acft 7 and 9	Mod
Radar	Mod
MMR Supportability Analysis	Mod
CV/MV-22 Common Spares Availability	Mod
Electromagnetic Compatibility/Interference	Mod
Update of LSAR Beyond EMD Contract	Mod
Left Hand Avionics Rack Rigidity	Mod
CV-22 Requirements Undetermined for NAMTS	CANX
DCS 2000 UHF/VHF Radio Procurement	Mod
AMC Throughput	Mod
Supportability Impact of CV-22 Wire Harness Design	Mod
Maintenance Manpower at Edwards AFB	Mod
Remanufacturing of Aircraft to CV	Mod
Army SIRFC Program Funding/Schedule Problems	High
Availability of CV-22 PSE for Acft 9 First Flight	Mod
AN/ALE-47 Safety Switch	Mod
Interference Canceller Interface Data	Mod
MMR Anti-ice System	Mod
AMC Delivery to Support JASS 3.2 Development	Mod

Weapon System:

The CV-22 will be uniquely configured and equipped to support the unified combatant commands. Critical aircraft features of the CV-22 will include: long-range, high-speed, passenger load capability; vertical/short takeoff and landing (V/STOL) capability; air refueling (using a probe) as a receiver from strategic (e.g., KC-135, KC-10) and tactical (e.g., MC-130E/H/P) tankers; first-pass precision navigation; robust self-defensive avionics; day/night TF/TA radar; shipboard compatibility; defensive armament and logistics supportability in the field. The aircraft will have a combat mission radius of at least 500 nautical miles (NM). The CV-22 will be fully shipboard compatible with self-folding prop-rotors and will be able to operate from landing helicopter assault (LHA), landing platform helicopter (LPH), landing helicopter dock (LHD), and landing platform dock (LPD-17) ships without reconfiguration or modification of the aircraft (including removal of the refueling probe). Maximum takeoff roll for a short takeoff (STO) from a ship will be no more than 300 feet (with 15 knots of headwind). The CV-22 will have a self-deployment capability of over 2100 NM with one refueling. Cruise airspeed will be 230 knots true airspeed (KTAS) at mission gross weight. In addition to its crew of 4 (2 pilots, 2 flight engineers [1 in the cockpit]), the aircraft will be capable of carrying 18 combat equipped troops. Cargo load configurations will allow multiple variations of internal cargo loads up to 8,000 pounds and sling-loaded external loads of 10,000 pounds. The CV-22 will contain a forward-looking infrared (FLIR) system, an upgraded night vision "B" all-glass cockpit, and an NBC over-pressurized cabin and cockpit. Provisions will be incorporated for a self-defensive weapon system. The CV-22 will be capable of low-level flight at 200 feet AGL, using TF/TA in both day and night, visual and instrument meteorological conditions. The navigation suite will provide the capability of a no-update, low-level flight for the entire combat radius, with the ability to perform a first-pass, coupled approach to a landing zone. Required accuracy of the navigation system will provide location of a landing zone within two times the rotor diameter (168 ft.), in 1/4-mile visibility, at night, from 100-feet AGL. The CV-22 will be able to rapidly self-deploy over long distances and operate with minimum support from austere forward operating locations (FOLs), forward operating bases (FOBs), and main operating bases (MOBs).

Supplemental Design

Description	Twin-turbine, vertical-lift, tiltrotor transport aircraft
Program Status	Low Rate Initial Production & Engineering and Manufacturing Development
Program Requirements	US Air Force - 50 CV-22As for US SOCOM for long range special operations
Flight-test Accomplishments	More than 2500 hours flown (over 1300 hours on EMD aircraft). Achieved speeds of 342 knots (402 mph; 647 km/hr); altitude of 25,000 ft.; gross weight of 60,500 lbs. and a G maneuver load factor of +3.9 at 260 knots. External loads of 10,000 lbs. have been carried at 230 knots.

Engines

Manufacturer .... Rolls-Royce Allison
Model.. Two -- AE1107C
Max & intermediate shp (kW)............ 6,150 (4,586)

Transmissions

Takeoff {USMC}, shp (kW).................. 4,570 (3,408)
Takeoff {USN}, shp (kW).................... 4,970 (3,706)
Takeoff {USAF}, shp (kW).................. 4,970 (3,706)
1 engine inoperative, shp (kW).......... 5,920 (4,415)

Weights

Empty, lbs (kg)....................................... 33,140 (15,032)
Takeoff, vertical, max, lbs (kg)........... 52,600 (23,860)
Takeoff, short, max, lbs (kg)................ 57,000 (24,948)
Takeoff, self-deploy (lbs (kg) 60,500 (27,443)
Cargo hook, single, lbs (kg).............. 10,000 (4,536)
Cargo hook, dual, lbs (kg).................. 15,000 (6,804)

Fuel Capacity

Sponsons, gals (liters)......................... 1,228 (4,649)
Wing, gal (liters) .... 787(2,979)
Aux, self-deployment , gals (liters)...... 2,436 (9,221)

Accommodation

Cockpit - crew seats (CV-22)............... 2 (3)
Cabin - troop seats / litters.................. 24 / 12

Dimensions, External

Length, fuselage, ft (m).......................... 57.33 (17.48)
Width, rotors turning, ft (m)....................... 84.6 (25.55)
Length, stowed, ft (m).............................. 62.58 (19.08)
Width, stowed, ft (m)................................. 18.42 (5.61)
Width, horizontal stabilizer, ft (m).............18.42 (5.61)
Height, nacelles fully vertical, ft (m)......... 21.76 (6.63)
Height, vertical stabilizer, ft (m).................. 17.65 (5.38)

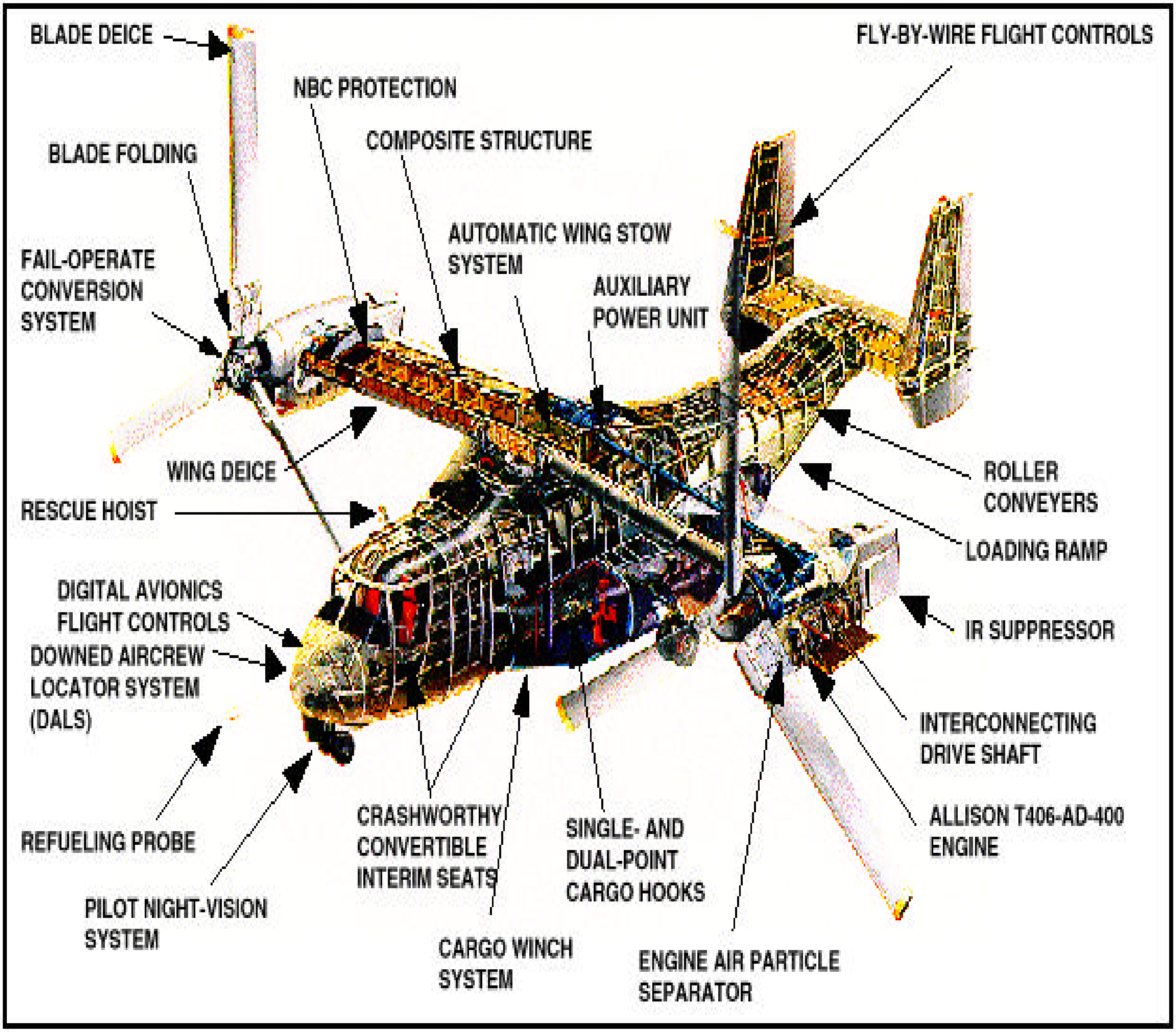
Dimensions, Internal

Length, max, ft (m).................................... 24.17 (7.37)
Width, max, ft (m).. 5.92 (1.80)
Height, max, ft (m)....................................... 6.00 (1.83)

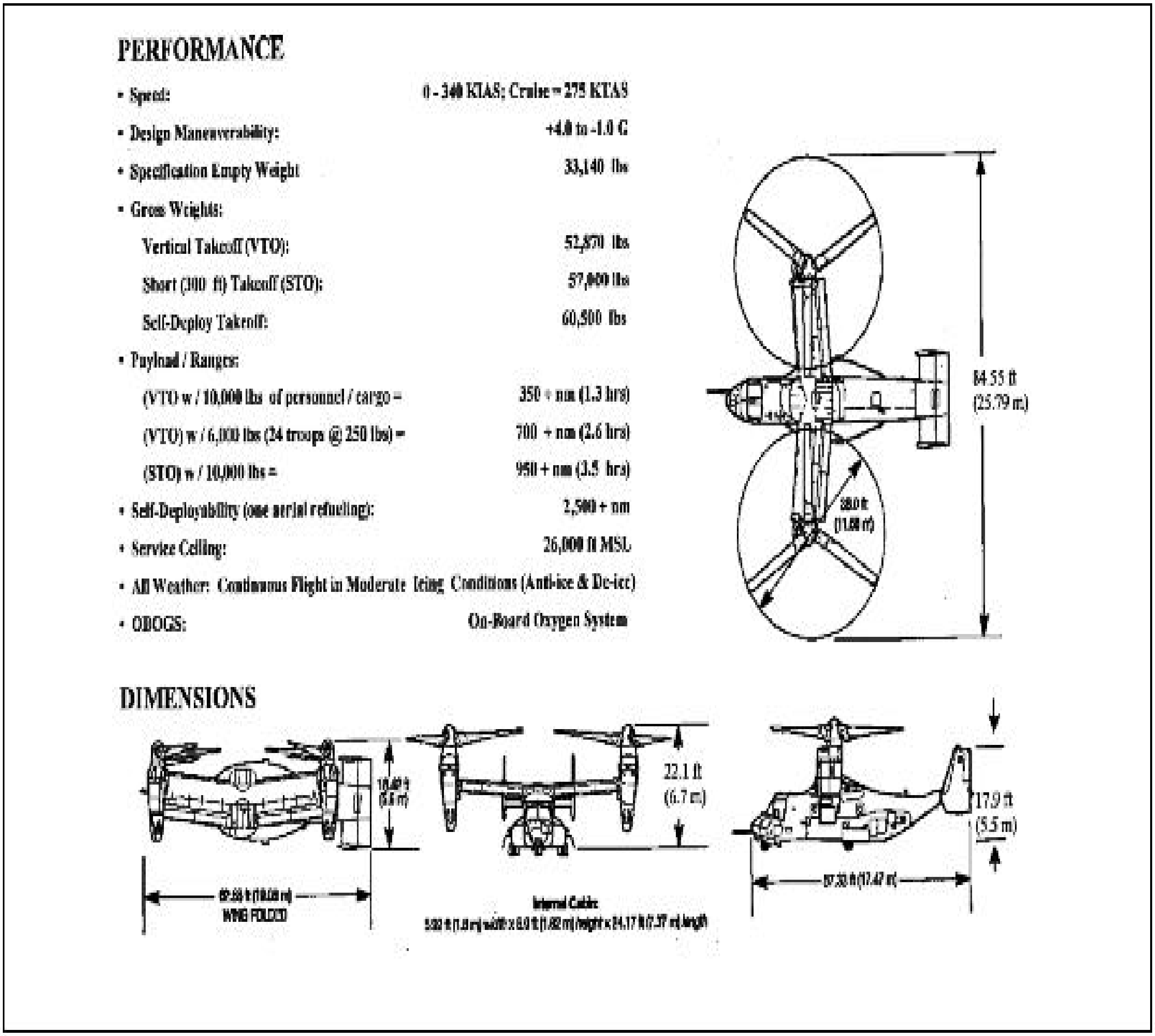
Performance

Max cruise speed, SL, kts (km/h)............. 275 (510)
Vertical rate of climb, SL, fpm (m/m)...... 1,090 (332)
Max rate of climb, SL, fpm (m/m)............. 2,320 (707)
Service Ceiling, ft (m).............................25,000 (7,925)
Service Ceiling, OEI, ft (m)....................11,300 (3,444)
HOGE, ft (m)..14,200 (4,328)
Amphibious assault, radius,............. two times 93 nm
Land assault radius,...236 nm
Long-range special operations radius........ 503 nm
Self-deployment range (one aerial refuel)...2,261nm

Source: USMC, 2000



Source: CMAP 2000



Source: CMAP 2000

APPENDIX B

NOISE ANALYSIS

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Appendix B

Noise Analysis

Noise

Noise, often defined as unwanted sound, is one of the most common environmental issues associated with aircraft operations. Of course, aircraft are not the only sources of noise in an urban or suburban surrounding, where interstate and local roadway traffic, rail, industrial, and neighborhood sources also intrude on the everyday quality of life. Nevertheless, aircraft are readily identifiable to those affected by their noise, and are typically singled out for special attention and criticism. Consequently, aircraft noise problems often dominate analyses of environmental impacts.

Sound is a physical phenomenon consisting of minute vibrations, which travel through a medium, such as air, and are sensed by the human ear. Whether sound is interpreted as pleasant (for example, music) or unpleasant (for example, aircraft noise) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound.

The measurement and human perception of sound involve two basic physical characteristics – intensity and frequency. Intensity is a measure of the acoustic energy of the sound vibrations and is expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second important physical characteristic is sound frequency, which is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.

The loudest sounds that can be detected comfortably by the human ear have intensities 1,000,000,000,000 times greater than those of sounds that can barely be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. Therefore, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a *sound level*.

A sound level of zero dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and eventually pain at still higher levels.

Because of the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels.

If the intensity of a sound is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition". The latter term is derived from the fact that when we add dB values, we first convert each dB value to its corresponding acoustic energy, then add the energies using the normal rules of addition, and finally convert the total energy back to its dB equivalent.

An important facet of dB addition arises later when the concept of time-average sound levels is introduced to explain DNL. Because of the logarithmic units, the time-average sound level is dominated by the louder levels, which occur during the averaging period. As a simple example, consider a sound level, which is 100 dB and lasts for 30 seconds, followed by a sound level of 50 dB which also lasts for 30 seconds. The time-average sound level over the total 60-second period is 97 dB, not 75 dB.

The minimum change in the sound level of individual events, which an average human ear can detect, is about three dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness. This relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity, but only a 50 percent decrease in perceived loudness because of the nonlinear response of the human ear (similar to most human senses).

Sound frequency is measured in terms of cycles per second (cps), or hertz (Hz), which is the preferred scientific unit for cps. The normal human ear can detect sounds that range in frequency from about 20 Hz to about 15,000 Hz. All sounds in this wide range of frequencies, however, are not heard equally well by the human ear, which is most sensitive to frequencies in the 1000 to 4000 Hz range. In measuring community noise, this frequency dependence is taken into account by adjusting the very high and very low frequencies to approximate the human ear's lower sensitivity to those frequencies. This is called "A-weighting" and is commonly used in measurements of community environmental noise.

Sound levels measured using A-weighting are most properly called A-weighted sound levels, while sound levels measured without any frequency weighting are most properly called sound levels. However, since most environmental impact analysis documents deal only with A-weighted sound levels, the adjective "A-weighted" is often omitted, and A-weighted sound levels are referred to simply as sound levels. In some instances, the author will indicate that the levels have been A-weighted by using the abbreviation dBA or dB(A), rather than the abbreviation dB, for decibel. As long as the use of A-weighting is understood to be used, there is no difference implied by the terms "sound level" and "A-weighted sound level" or by the units dB, dBA, and dB(A).

Sound levels do not represent instantaneous measurements but rather averages over short periods of time. Two measurement time periods are most common – one second and one-eighth of a second. A measured sound level averaged over one second is called a slow response sound level; one averaged over one-eighth of a second is called a fast response sound level. Most environmental noise studies use slow response measurements, and the adjective "slow response" is usually omitted. The proper descriptor "slow response A-weighted sound level" is usually shortened to "sound level" in environmental impact analysis documents.

Noise Metrics

A "metric" is defined as something "of, involving, or used in measurement." As used in environmental noise analyses, a metric refers to the unit or quantity that quantitatively measures the effect of noise on the environment. Noise studies have typically involved a confusing proliferation of noise metrics as individual researchers have attempted to understand and represent the effects of noise. As a result, past literature describing environmental noise or environmental noise abatement has included many different metrics.

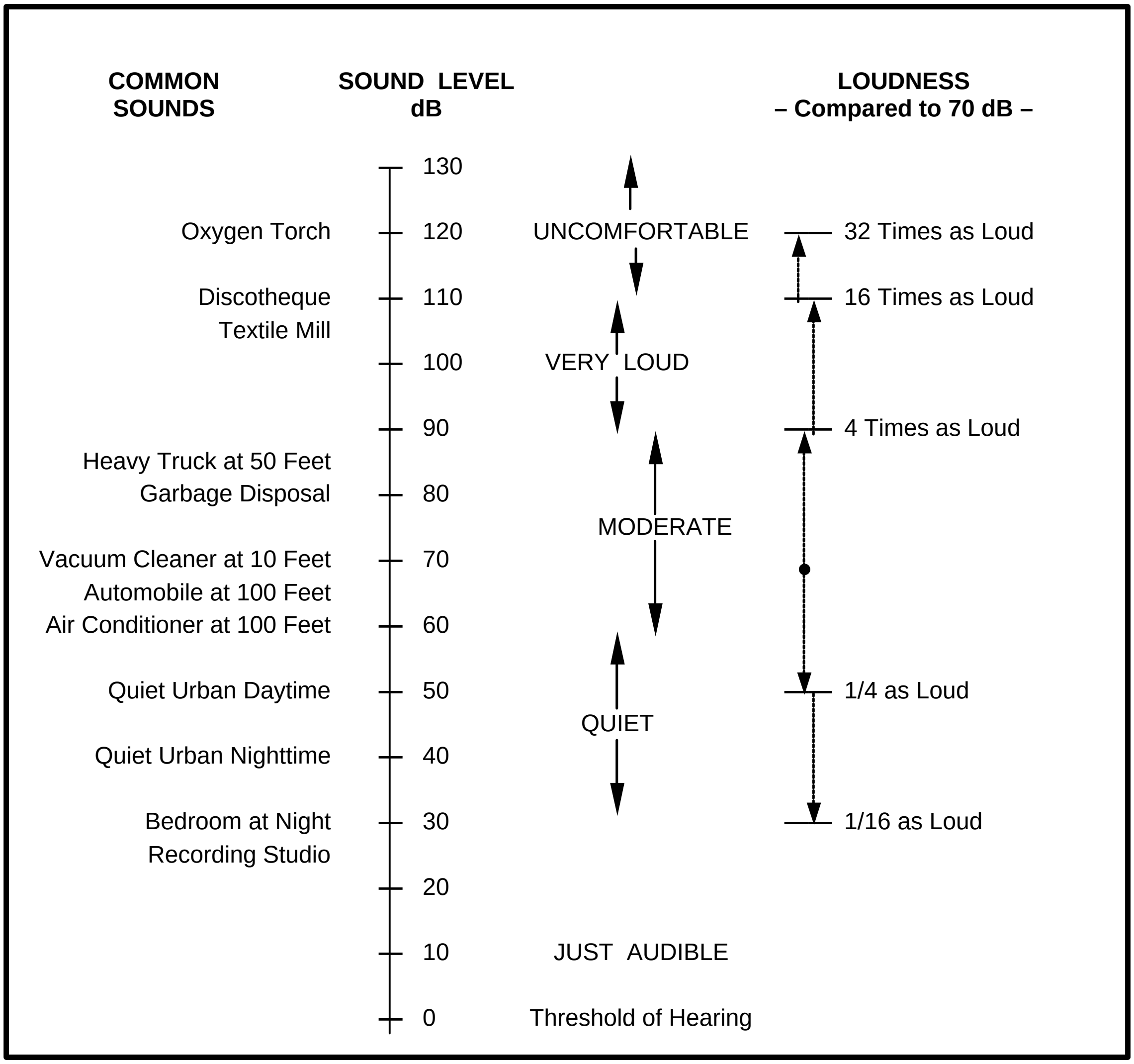
However, various federal agencies involved in environmental noise mitigation have agreed on common metrics for environmental impact analysis documents, and both the Department of Defense and the Federal Aviation Administration (FAA) have specified those which should be used for federal aviation noise assessments.

Sections B1.2.1 through B1.2.3 describe the common metrics, which are used for U.S. assessments.

Maximum Sound Level (ALM)

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated as ALM, L_{max} or L_{Amax} .

The maximum sound levels of typical events are shown in Figure B-1. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleep, or other common activities.



Source: *Handbook of Noise Control*, C.M. Harris, Editor, McGraw-Hill Book Co., 1979, and Reference B5.

FigureB1-1. Typical A-weighted Sound Levels of Common Sounds

Sound Exposure Level (SEL)

Individual time-varying noise events have two main characteristics – a sound level which changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (SEL or L_{AE}) combines both of these characteristics into a single metric.

SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of the constant sound that would, in one second, generate the same acoustic energy as did the actual time-varying noise event. Since aircraft overflights usually last longer than one second, the SEL of an overflight is usually greater than the maximum sound level of the overflight.

Note that SEL is a composite metric that represents both the intensity of a sound and its duration. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level.

Because the SEL and the maximum sound level are both A-weighted sound levels expressed in decibels, there is sometimes confusion between the two, so the specific metric used should be clearly stated.

Day-Night Average Sound Level (DNL)

Time-average sound levels are measurements of sound levels that are averaged over a specified length of time. These levels provide a measure of the average sound energy during the measurement period.

For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (DNL or L_{dn}) is used. DNL averages aircraft SELs at a location over a complete 24-hour period, with a 10-dB adjustment added to those noise events that take place between 10:00 p.m. and 7:00 a.m. (local time) the following morning. This 10-dB "penalty" represents the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

Ignoring the 10-dB nighttime adjustment for the moment, DNL may be thought of as the continuous A-weighted sound level that would be present if all of the variations in sound level, which occur over a 24-hour period were smoothed out so as to contain the same total sound energy.

DNL provides a single measure of overall noise impact, but does not provide specific information on the number of noise events or the individual sound levels that occur during the day. For example, a DNL of 65 dB could result from a very few noisy events, or a large number of quieter events.

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. Scientific studies and social surveys, which have been conducted to appraise community annoyance to all types of environmental noise, have found the DNL to be the best measure of that annoyance. Its use is endorsed by the scientific community (References B1 through B5).

The results of attitudinal surveys about aircraft noise conducted in different countries to find the percentages of groups of people who express various degrees of annoyance when exposed to different levels of DNL show a remarkable consistency.

This consistency is illustrated in Figure B1-2, which summarizes the results of a large number of social surveys relating community responses to various types of noises, measured in DNL.

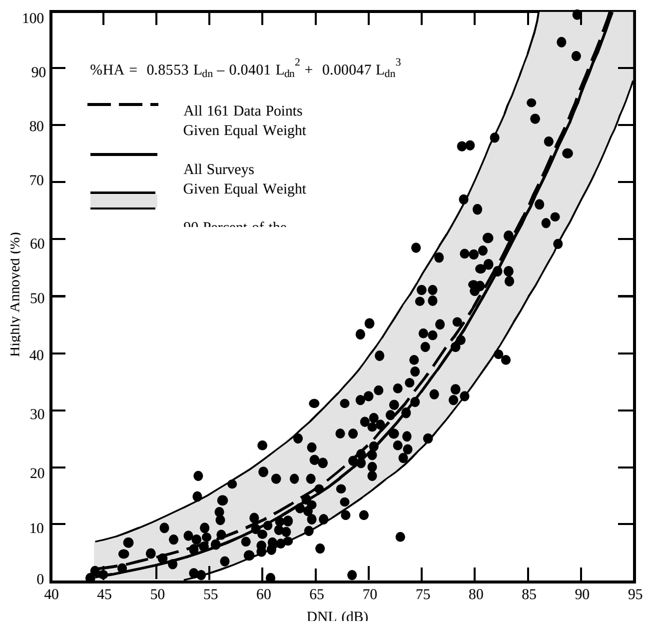


Figure B1-2. Community Surveys of Noise Annoyance (Reference A6)

Reference B6, from which Figure B1-2 was taken, was published in 1978. A more recent study has reaffirmed this relationship (Reference B7). In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors, which influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.

This relation between community annoyance and time-average sound level has been confirmed, even for infrequent aircraft noise events. Reference B8 reported the reactions of individuals in a community to daily helicopter overflights, ranging from one to 32 per day. The stated reactions to infrequent helicopter overflights correlated quite well with the daily time-average sound levels over this range of numbers of daily noise events.

The use of DNL has been criticized recently as not accurately representing community annoyance and land-use compatibility with aircraft noise. Much of that criticism stems from a lack of understanding of the basis for the measurement or calculation of L_{dn}. One frequent criticism is based on the perception that people react more to single noise events and not as much to "meaningless" time-average sound levels.

In fact, a time-average noise metric, such as L_{dn}, takes into account both the noise levels of all individual events which occur during a 24-hour period and the number of times those events occur. As described briefly above, the logarithmic nature of the decibel unit causes the noise levels of the loudest events to control the 24-hour average.

As a simple example of this characteristic, consider a case in which only one aircraft overflight occurs in daytime during a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.5 dB. Assume, as a second example, that ten such 30-second overflights occur in daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.4 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events. This is the basic concept of a time-average sound metric, and specifically the DNL.

Onset-rate Adjusted DNL

Aircraft operations along low-altitude Military Training Routes (MTRs) and in Military Operating Areas (MOAs) and Restricted Areas/Ranges generate a noise environment different from other community noise environments. Overflights can be highly sporadic, ranging from many (e.g., ten per hour) to few (less than one per week). This situation differs from most community noise environments in which noise tends to be continuous or patterned.

Individual military overflight events also differ from typical community noise events, because of the low-altitude and high-airspeed characteristics of military aircraft. These characteristics result in aircraft that exhibit a rate of increase in sound level (onset rate) of up to 30 dB per second. The DNL metric is adjusted to account for the "surprise" effect of the onset rate of aircraft noise on humans with an adjustment ranging up to 11 dB added to the normal SEL (Reference A9). Onset rates between 15 to 150 dB per second require an adjustment of from 0 to 11 dB, while onset rates below 15 dB per second require no adjustment. The adjusted DNL is designated as Onset-rate Adjusted Day-Night Average Sound Level (L_{dnr}). Because of the sporadic occurrences of aircraft overflights along MTRs, in MOAs and Restricted Areas/Ranges, the number of average daily operations is determined from the calendar month with the highest number of operations in each area. This monthly average is denoted L_{dnmr}.

NOISE EFFECTS

Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an eight-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4000 Hz, after a 40-year exposure) suggests a time-average sound level of 70 dB over a 24-hour period. Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, never have been found to occur at levels below those protective criterion against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions.

The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on 22–24 January 1990 in Washington, D.C.:

"The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day). At the recent (1988) International Congress on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss, and even above these criteria, results regarding such health effects were ambiguous. Consequently, one comes to the conclusion that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place." (Reference A9; parenthetical wording added for clarification.)

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies, which purport to find such health effects, use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two UCLA researchers apparently found a relation between aircraft noise levels under the approach path to Los Angeles International Airport (LAX) and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Reference B10). Nevertheless, three other UCLA professors analyzed those same data and found no relation between noise exposure and mortality rates (Reference B11).

As a second example, two other UCLA researchers used this same population near LAX to show a higher rate of birth defects in 1970–1972 when compared with a control group residing away from the airport (Reference B12). Based on this report, a separate group at the U.S. Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport (ATL) for 1970–1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Reference B13).

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the U.S. Environmental Protection Agency (EPA) as any negative subjective reaction on the part of an individual or group (Reference B3). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

It is often suggested that a lower DNL, such as 60 or 55 dB, be adopted as the threshold of community noise annoyance for airport environmental analysis documents. While there is no technical reason why a lower level cannot be measured or calculated for comparison purposes, a DNL of 65 dB:

1. Provides a valid basis for comparing and assessing community noise effects.
2. Represents a noise exposure level, which is normally dominated by aircraft noise and not other community or nearby highway noise sources.
3. Reflects the FAA's threshold for grant-in-aid funding of airport noise mitigation projects.

The U.S. Department of Housing and Urban Development (HUD) also established a DNL standard of 65 dB for eligibility for federally guaranteed home loans. For this noise study, levels of DNL equal to and greater than 60 dB were used for assessing community noise impact.

Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities such as radio or television listening, telephone use, or family conversation gives rise to frustration and annoyance. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that "whenever intrusive noise exceeds approximately 60 dB indoors, there will be interference with speech communication" (Reference B5).

Indoor speech interference, per Reference B3, can be expressed as a percentage of sentence intelligibility among two people speaking in relaxed conversation approximately one meter apart in a typical* living room or bedroom. The percentage

* "Typical" is defined as a room with about 300 sabins of sound absorption which, according to Reference B3, is representative of living rooms and bedrooms. A sabin is a unit of measure of sound absorption of a surface.

of sentence intelligibility is a non-linear function of the (steady) indoor background A-weighted sound level as shown in Figure B2-1. This curve was digitized and curve-fitted for the purposes of this appendix. Such a curve-fit yields 100 percent sentence intelligibility for background levels below 57 dB, and yields less than 10 percent intelligibility for background levels above 73 dB. Note that the function is especially sensitive to changes in sound level between 65 dB and 75 dB. As an example of the sensitivity, a one-dB increase in background sound level from 70 dB to 71 dB yields a 14 percent decrease in sentence intelligibility.

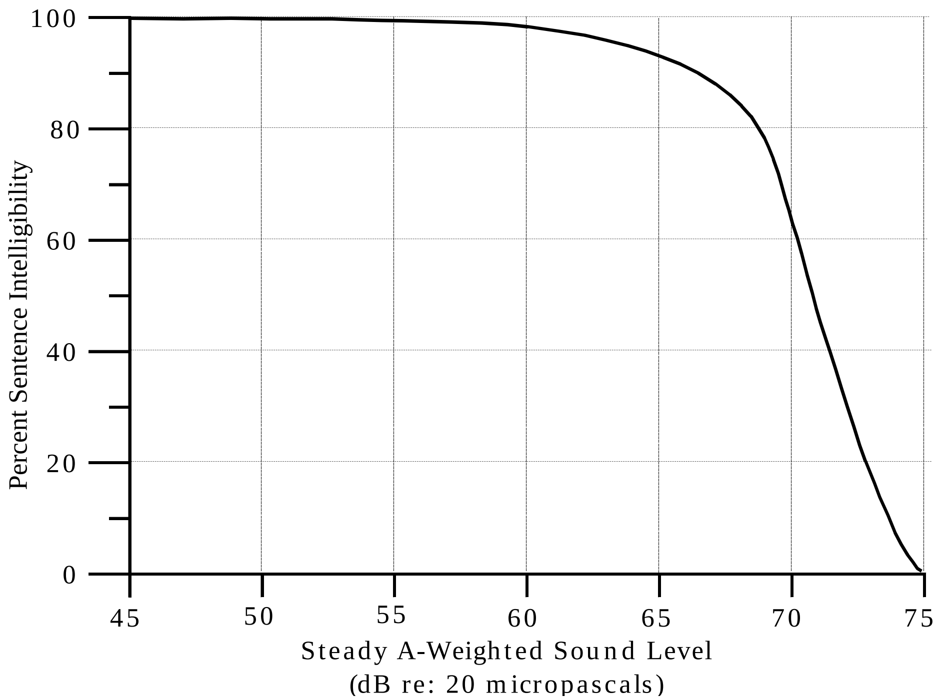


Figure B2-1. Percent Sentence Intelligibility (Reference B3)

Sleep Disturbance

Sleep disturbance is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning. Sleep disturbance can be measured in either of two ways. “Arousal” represents awakening from sleep, while a change in “sleep stage” represents a shift from one of four sleep stages to another stage of lighter sleep without awakening. In general, arousal requires a higher noise level than does a change in sleep stage.

In terms of average daily noise levels, some guidance is available to judge sleep disturbance. The EPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (Reference B3). Assuming a conservative structural noise insulation of 20 dB for typical dwellings, 45 dB corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

In June 1997, the Federal Interagency Committee on Aviation Noise (FICAN) reviewed the sleep disturbance issue and presented a sleep disturbance dose-response prediction curve (Reference B14), which was based on data from field studies in References A16 through B20, as the recommended tool for analysis of potential sleep disturbance for residential areas.

Figure B2-2 shows this curve which, for an indoor SEL of 60 dB, predicts that a maximum of approximately five percent of the residential population exposed are expected to be behaviorally awakened. FICAN cautions that this curve should only be applied to long-term adult residents.

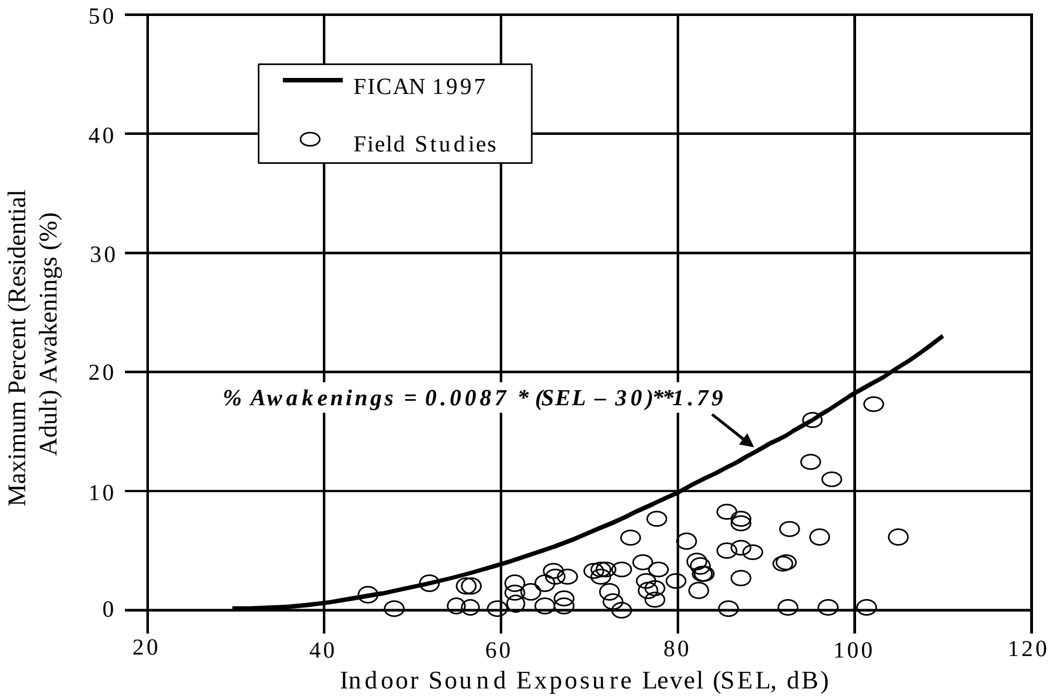


Figure B2-2. Sleep-disturbance Dose-response Relationship

Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans – stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

Many scientific studies are available regarding the effects of noise on wildlife as well as some anecdotal reports of wildlife "flight" due to noise. Few of these studies or reports include any reliable measures of the actual noise levels involved.

In the absence of definitive data on the effect of noise on animals, the Committee on Hearing, Bioacoustics, and Biomechanics of the National Research Council has proposed that protective noise criteria for animals be taken to be the same as for humans (Reference B15).

Effects of Noise-induced Vibration on Structures and Humans

The sound from an aircraft overflight travels from the exterior to the interior of the house in one of two ways: through the solid structural elements and directly through the air. Figure B2-3 illustrates the sound transmission through a wall constructed with a brick exterior, stud framing, interior finish wall, and absorbent material in the cavity. The sound transmission starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finish surface vibrating, with some energy lost in the airspace. This surface then radiates sound into the dwelling interior. As the figure shows, vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

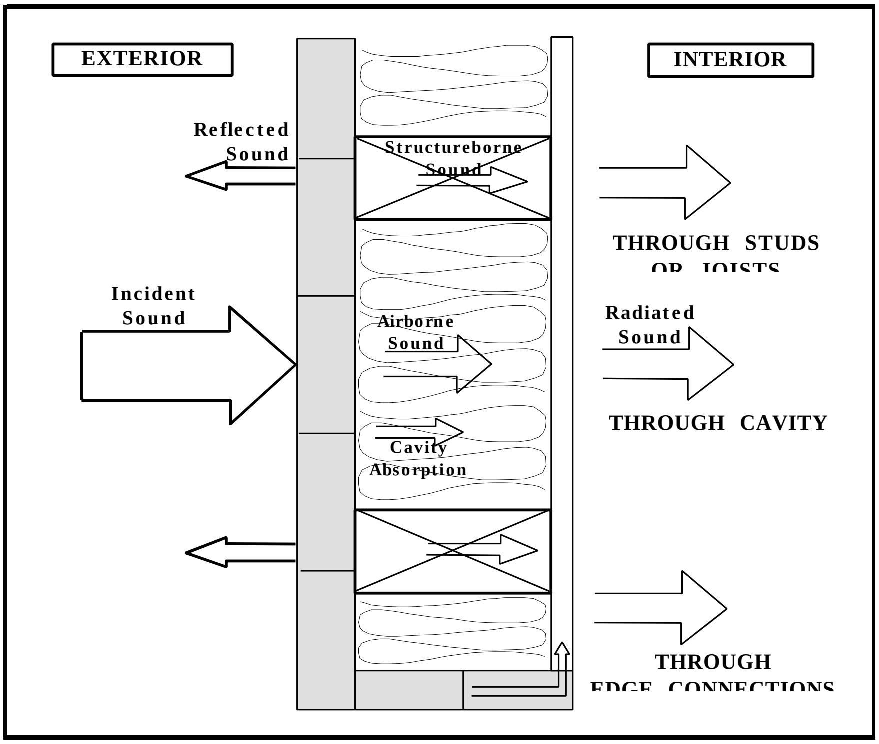


Figure B2-3. Pictorial Representation of Sound Transmission through Built Construction

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of structural damage. While certain frequencies (such as 30 hertz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Reference B20).

In terms of average acceleration of wall or ceiling vibration, the thresholds for structural damage (Reference B22) are:

- 0.5 m/s/s – threshold of risk of damage to sensitive structures (i.e., ancient monuments, etc.).
- m/s/s – threshold of risk of damage to normal dwellings (i.e., houses with plaster ceiling and walls).
- where m/s/s is the nomenclature for acceleration in units of meters per second per second or meters per second squared.

Noise-induced structural vibration may also annoy dwelling occupants because of induced secondary vibrations, or "rattle", of objects within the dwelling – hanging pictures, dishes, plaques, and bric-a-brac. Loose windowpanes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally compatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

In the assessment of vibration on humans, the following factors determine if a person will perceive and possibly react to building vibrations:

1. type of excitation: steady state, intermittent, or impulsive vibration
2. frequency of the excitation (ISO 2631-2 [Reference B21] recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans.)
3. orientation of the body with respect to the vibration
4. use of the occupied space (i.e., residential, workshop, hospital)
5. time of day

Table B2-1 lists the whole-body vibration criteria from Reference B21 for one-third octave frequency bands from 1 to 80 Hz.

Table B2-1. Vibration Criteria for the Evaluation of Human Exposure to Whole-body Vibration

Frequency (Hz)	RMS Acceleration (m/s/s)		
	Combined Criteria Base Curve	Residential Night	Residential Day
1	0.0036	0.0050	0.0072
1.25	0.0036	0.0050	0.0072
1.6	0.0036	0.0050	0.0072
2	0.0036	0.0050	0.0072
2.5	0.0037	0.0052	0.0074
3.15	0.0039	0.0054	0.0077
4	0.0041	0.0057	0.0081
5	0.0043	0.0060	0.0086
6.3	0.0046	0.0064	0.0092
8	0.0050	0.0070	0.0100
10	0.0063	0.0088	0.0126
12.5	0.0078	0.0109	0.0156
16	0.0100	0.0140	0.0200
20	0.0125	0.0175	0.0250
25	0.0156	0.0218	0.0312
31.5	0.0197	0.0276	0.0394
40	0.0250	0.0350	0.0500
50	0.0313	0.0438	0.0626
63	0.0394	0.0552	0.0788
80	0.0500	0.0700	0.1000

Source: Reference B18.

Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow structures, especially in mountainous areas, causing landslides or avalanches. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations.

Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment.

One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport (IAD).

These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Reference B22). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning.

As noted above for the noise effects of noise-induced vibrations of normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

References for Appendix B

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B5. *Federal Agency Review of Selected Airport Noise Analysis Issues*, Federal Interagency Committee on Noise, August 1992.

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B20. von Gierke, H.E., and Ward, W.D., *Criteria for Noise and Vibration Exposure*, *Handbook of Acoustical Measurements and Noise Control*, Third Edition, 1991.

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APPENDIX C

CONSISTENCY STATEMENT

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APPENDIX C
CONSISTENCY STATEMENT

This consistency statement will examine the potential environmental consequences of the Proposed Action and ascertain the extent to which the consequences of the Proposed Action are consistent with the objectives of the Florida Coastal Management Program (FCMP).

Of the Florida Statutory Authorities included in the FCMP, impacts in the following areas are addressed in the EA: beach and shore preservation Chapter (161), historic preservation (chapter 267), economic development and tourism (chapter 288), public transportation (Chapters 334 and 339), saltwater living resources (Chapter 370), living land and freshwater resource (Chapter 372), water resources (Chapter 373), environmental control (Chapter 403), and soil and water conservation (Chapter 582). This consistency statement discusses how the proposed options may meet the FCMP objectives.

CONSISTENCY DETERMINATION

Chapter 161: Beach and Shore Preservation

No disturbances to the base's canals or shoreline are foreseen under the Proposed Action or the Alternative Action.

Chapter 267: Historic Preservation

The Proposed Action and the No Action Alternative would not impact historic areas. Due to the absence of direct or indirect impacts on historical properties, consultations between the Air Force and the State Historic Preservation Officer are not required.

Chapter 288: Economic Development and Tourism

The EA presents the new employment impact and net income impact of the Proposed Action and the No Action Alternative. The options would not have significant adverse effects on any key Florida industries or economic diversification efforts.

The EA quantitatively addresses potential impacts to transportation systems and planning and implementation of transportation improvements.

Chapter 372: Saltwater Living Resources

The EA addresses potential impacts to local water bodies. Water quality impacts were surveyed for existing conditions for the Proposed Action and the No Action Alternative. Results indicate that no impacts would result from the Proposed Action or the alternative.

Chapter 372: Living Land and Freshwater Resources

Threatened and endangered species, major plant communities, conservation of native habitat, and mitigation of potential impacts to the resources are addressed in the EA. The Proposed Action and the alternative would not result in disturbance to native habitat and should not impact threatened or endangered species.

Chapter 373: Water Resources

Impacts to surface water quality are addressed in the EA. Additional details regarding surface water impacts may have to be supplied by Hurlburt Field in the permit applications for the National Pollutant Discharge Elimination System and the state's Surface Water Management Program.

Chapter 403: Environmental Control

The EA addresses the issues of conservation and protection of environmentally sensitive living resources; protection of groundwater and surface water quality and quantity; potable water supply; protection of air quality; minimization of adverse hydrogeologic impacts; protection of endangered or threatened species; solid, sanitary, and hazardous waste disposal; and protection of floodplains and wetlands. Where impacts to these resources can be identified, possible mitigation measures are suggested. Implementation of mitigations will, for the most part, be the responsibility of Hurlburt Field.

Chapter 582: Soil and Water Conservation

The EA addresses the potential of the Proposed Action and the alternative to disturb soil and presents possible measures to prevent or minimize soil erosion. Impacts to groundwater and surface water resources also are discussed in the EA.

CONCLUSION

The Air Force finds that the conceptual Proposed Action and the No Action Alternative plans presented in the EA are consistent with the FCMP.

APPENDIX D

TRANSMITTAL LETTERS

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

17 May 2001

MEMORANDUM USACE - Mobile
U.S. Army Corps of Engineers
Mobile District
Attn: Regulatory Branch (OP-SA)
109 St. Joseph Street
Mobile AL, 36602

FROM: HQ AFCEE/ECA
3207 North Road
Brooks AFB TX 78235-5363

SUBJECT: Transmittal of the CV-22 Beddown at Hurlburt Field, Florida Draft-Final Environmental Assessment

The Draft Final-Environmental Assessment (DF-EA), at attachment 2, is provided for your use and records. It is being circulated to the organizations identified in attachment 1 and will be available for a 30-day review. The review period begins on May 18 and extends through June 18, 2001. The public is being informed to submit their comments by mail or fax for receipt by HQ AFCEE on or before June 25, 2001 to ensure that their comments receive full consideration.

If you have any questions concerning the CV-22 Beddown at Hurlburt Field, Florida DF-EA please call Mr. Charles Brown at (210) 536-4203, DSN 240-4203.

JONATHAN D. FARTHING
Chief, Environmental Analysis Division
Environmental Conservation and Planning Directo

Attachments:
1. Distribution List
2. CV-22 Beddown at Hurlburt Field, Florida Draft Final-EA

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

17 May 2001

MEMORANDUM FOR UNITED STATES FISH AND WILDLIFE SERVICE (USFWS)
Attn: Stan Simpkins
1601 Balboa Ave
Panama City, FL 32405

FROM: HQ AFCEE/ECA
3207 North Road
Brooks AFB TX 78235-5363

SUBJECT: Transmittal of the CV-22 Beddown at Hurlburt Field, Florida Draft-Final Environmental Assessment

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JONATHAN D. FARTHING
Chief, Environmental Analysis Division
Environmental Conservation and Planning Directo

Attachments:
1. Distribution List
2. CV-22 Beddown at Hurlburt Field, Florida Draft Final-EA

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

17 May 2001

MEMORANDUM FOR NATIONAL MARINE FISHERIES SERVICE (NMFS)
Attn: Jennifer Robinson
3500 Delwood Beach Road
Panama City, FL 32408

FROM: HQ AFCEE/ECA
3207 North Road
Brooks AFB TX 78235-5363

SUBJECT: Transmittal of the CV-22 Beddown at Hurlburt Field, Florida Draft-Final Environmental Assessment

The Draft Final-Environmental Assessment (DF-EA), at attachment 2, is provided for your use and records. It is being circulated to the organizations identified in attachment 1 and will be available for a 30-day review. The review period begins on May 18 and extends through June 18, 2001. The public is being informed to submit their comments by mail or fax for receipt by HQ AFCEE on or before June 25, 2001 to ensure that their comments receive full consideration.

If you have any questions concerning the CV-22 Beddown at Hurlburt Field, Florida DF-EA please call Mr. Charles Brown at (210) 536-4203, DSN 240-4203.

JONATHAN D. FARTHING
Chief, Environmental Analysis Division
Environmental Conservation and Planning Directo

Attachments:
1. Distribution List
2. CV-22 Beddown at Hurlburt Field, Florida Draft Final-EA

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

17 May 2001

MEMORANDUM FOR FLORIDA STATE CLEARING HOUSE
Attn: Jasmine Raffington
2555 Shumard Oak Blvd.
Tallahassee, FL 32339-2100

FROM: HQ AFCEE/ECA
3207 North Road
Brooks AFB TX 78235-5363

SUBJECT: Transmittal of the CV-22 Beddown at Hurlburt Field, Florida Draft-Final Environmental Assessment

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JONATHAN D. FARTHING
Chief, Environmental Analysis Division
Environmental Conservation and Planning Directc

Attachments:
1. Distribution List
CV-22 Beddown at Hurlburt Field, Florida Draft Final-EA

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

17 May 2001

MEMORANDUM FOR HQ AFSOC/CEVQ
ATTENTION: MR. RON NASCA

FROM: HQ AFCEE/ECA
3207 North Road
Brooks AFB TX 78235-5363

SUBJECT: Transmittal of the CV-22 Beddown at Hurlburt Field, Florida Draft-Final Environmental Assessment

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JONATHAN D. FARTHING
Chief, Environmental Analysis Division
Environmental Conservation and Planning Directo

Attachments:

2. Distribution List
3. CV-22 Beddown at Hurlburt Field, Florida Draft Final-EA

Draft Final-Environmental Assessment for the CV-22 Beddown at Hurlburt Field, Florida Distribution List

Federal Agencies

United States Fish and Wildlife Service (USFWS)
Attn: Stan Simpkins
1601 Balboa Ave
Panama City, FL 32405
850-769-5430

National Marine Fisheries Service (NMFS)
Attn: Jennifer Robinson
3500 Delwood Beach Road
Panama City, FL 32408
850-234-5061

U.S. Army Corps of Engineers (USACE) - Mobile
Attn: Regulatory Branch (OP-SA)
109 St. Joseph Street
Mobile AL, 36602

State Agencies

Florida State Clearing House
Attn: Jasmine Raffington
2555 Shumard Oak Blvd.
Tallahassee, FL 32339-2100
850-922-5438

North Carolina Department of Cultural Resources
State Historic Preservation Officer
Attn: Ms. Renee Gledhill-Earley
4617 Mail Service Center
Raleigh, NC 27699-4617

U.S. Air Force

Hurlburt Field, FL

HQ AFSOC/CEV: 2 copies
Attn: Mr. Ron Nasca
HQ AFSOC/CEV
427 Cody Ave, B-90333
Hurlburt Field, FL 32544-5273
Phone number: (850) 884-5984

HQ AFSOC/XPPP: 2 copies
Maj. Darren Eldridge

HQ AFSOC/JA: 1 copies
Maj. Robert Drone

HQ AFSOC/PA: 1 copies
Capt. Denise Shorb

16 SOW/XP: 1 copy
Maj. Albert Williams

16 CES/CEV: 2 copies
Ms. Traci Dewar
Mr. Phillip Pruitt

16 SPTG/CCX: 1 copy
Mr. Sidney Brown

Eglin AFB, FL

46 TW/XPE: 2 copies
Mr. Jesse Borthwick
Mr. Thomas Heffernan

AAC/EMSP: 1 copy
Ms. Elizabeth Vanta

Libraries

Fort Walton Beach Library: 1 copy
105 SE Miracle Strip Parkway
Fort Walton Beach, FL. 32549

Navarre Library: 1 copy
(Can't find name or address)

Niceville Library: 1 copy
100 Armstrong Ave
Niceville, FL

Community Organizations

Military Affairs Council: 1copy
Mr. C. H. Long, Chairman
Military Affairs Council
c/o Long Insurance Agency
PO Box 2530
Fort Walton Beach, FL 32549

Fort Walton Beach Chamber of Commerce
34 Miracle Strip Parkway SE
PO Box 640
Fort Walton Beach, FL 32549-0640

APPENDIX E

AGENCY COMMENT LETTERS

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STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

LEE H. WARNER
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

November 28, 2000

John C. Martin
Parsons Engineering Science, Inc.
3450 Buschwood Park Drive, Suite 345
Tampa, Florida 33618

Re: AHC 01-0304
USAF Beddown of CV-22 Oprey
Hurlbert Field
Statewide in Alabama

Dear Mr. Martin:

Upon review of the information forwarded by your office, the Alabama Historical Commission has determined that the project activities will have no adverse effect on any cultural resources listed on or eligible for the National Register. Therefore, our office can concur with the proposed activities.

However, should any archaeological cultural resources be encountered during project activities, work shall cease and our office shall be consulted immediately. This stipulation shall be placed on the construction plans to insure contractors are aware of it.

We appreciate your efforts on this issue. If we may be of further service or if you have any questions or comments, please contact Stacye Hathorn or Greg Rhinehart of our office and be sure to include the project number referenced above.

Sincerely,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/TOM/SGH/GCR

DIVISIONS OF FLORIDA DEPARTMENT OF STATE
Office of the Secretary
Office of International Relations
Division of Elections
Division of Corporations
Division of Cultural Affairs
Division of Historical Resources
Division of Library and Information Services
Division of Licensing
Division of Administrative Services

MEMBER OF THE FLORIDA CABINET
State Board of Education
Trustees of the Internal Improvement Trust Fund
Administration Commission
Florida Land and Water Adjudicatory Commission
Siting Board
Division of Bond Finance
Department of Revenue
Department of Law Enforcement
Department of Highway Safety and Motor Vehicles
Department of Veterans' Affairs

FLORIDA DEPARTMENT OF STATE
Katherine Harris
Secretary of State
DIVISION OF HISTORICAL RESOURCES

Mr. John C. Martin
Parsons Engineering Science, Inc,
3450 Buschwood Park Drive
7621 Hillsborough Loop Drive, Suite 345
Tampa, Florida 33618

November 13, 2000

RE: DHR Project File No. 2000-09164
United States Air Force
Proposed Environmental Assessment for the Beddown and Operation of the CV-22 Osprey at Hurlburt Field, Florida

Dear Mr. Martin:

Our office has received and reviewed the above referenced project in accordance with Section 106 of the *National Historic Preservation Act of 1966* (Public Law 89-665), as amended in 1992, and *36 C.F.R., Part 800: Protection of Historic Properties*. The State Historic Preservation Officer (SHPO) is to advise and assist federal agencies when identifying historic properties (listed or eligible for listing, in the National Register of Historic Places), assessing effects upon them, and considering alternatives to avoid or reduce the project's effect on them.

It is the opinion of this agency that because of the project nature it is considered unlikely that historic properties will be affected. Therefore, based on the information provided, it is the opinion of this office that no historic properties will be affected by this undertaking.

If you have any questions concerning our comments, please contact Scott Edwards, Historic Preservation Planner, at 850-487-2333 or 800-847-7278.

Sincerely,

Frederick P. Gaske, Deputy SHPO

Janet Snyder Matthews, Ph.D., Director
Division of Historical Resources
State Historic Preservation Officer

JSM/Ese

CONTACT MEMO

PERSON CONTACTED: Michelle Evans, Georgia Department of Natural Resources, Historic Preservation Division

CONTACTED BY: John C. Martin

DATE: December 8, 2000

REGARDING: Impacts of CV-22 operations on Georgia cultural resources

DISCUSSION: Ms. Evans indicated that the state of Georgia did not anticipate any impacts to cultural resources due to overflights of the CV-22 during training missions in their state.

CONTACT MEMO

PERSON CONTACTED: Renee Gledhill-Earley, North Carolina Department of Cultural Resources, State Historic Preservation Office

CONTACTED BY: John C. Martin

DATE: December 11, 2000

REGARDING: Impacts of CV-22 operations on North Carolina cultural resources

DISCUSSION: Ms. Gledhill-Earley indicated that the policy in North Carolina regarding impact of overflights on cultural resources was to reserve comment until they receive a copy of the Environmental Assessment and had an opportunity to review the EA in detail.

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

December 6, 2000

Mr. John C. Martin
Parsons Engineering Seience, Inc.
3450 Buschwood Pk Dr./345
Tampa, Florida 33618

RE: DOD, CV-22 OSPREY OPERATIONS/HURLBUT FL, UNINCORPORATED, MULTI COUNTY

Dear Mr. Martin:

Pursuant to your request, this office has reviewed documentation concerning the above-referenced undertaking received Tuesday, December 5, 2000. This is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (64 FR 27044, May 18, 1999).

After considering the documentation submitted, it is our opinion that THERE ARE NO NATIONAL REGISTER OF HISTORIC PLACES LISTED OR ELIGIBLE PROPERTIES AFFECTED BY THIS UNDERTAKING. This determination is made either because of the location, scope and/or nature of the undertaking, and/or because of the size of the area of potential effect; or because no listed or eligible properties exist in the area of potential effect; or because the undertaking will not alter any characteristics of an identified eligible or listed property that qualify the property for listing in the National Register or alter such property's location, setting or use. Therefore, this office has no objections to your proceeding with the project.

If you are applying for federal funds, license or permit, you should submit this letter as evidence of consultation under Section 106 to the appropriate federal agency, which, in turn, should contact this office as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination of eligibility and effect to this office for comment. You may direct questions or comments to Joe Garrison (615)532-1559. This office appreciates your cooperation.

Sincerely,

Herbert L. Harper

Herbert L. Harper
Executive Director and
Deputy State Historic
Preservation Officer

HLH/jyg

APPENDIX F

PUBLIC NOTICE

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Public Notification

In compliance with the National Environmental Policy Act, Hurlburt Field announces the availability of the Environmental Assessment and draft Finding of No Significant Impact for "CV-22 Beddown at Hurlburt Field, Florida" for public review.

The Proposed Action of, "CV-22 Beddown at Hurlburt Field, Florida" is to replace the existing MH-53 helicopters with a crisis response aircraft capable of extended operating ranges, faster operating speeds, and the ability to take off and land vertically. The aircraft will have terrain-following and terrain-avoidance radar, extended-range fuel tanks, an integrated navigation system, and a reduced acoustic noise level. Because of these capabilities, the CV-22 Osprey would not only replace the MH-53's role in medium-lift operations, but provide the USAF with enhanced operational capabilities.

Copies of the Environmental Assessments and draft Finding of No Significant Impact (FONSI) can be reviewed at the Fort Walton Beach Public Library, 105 SE Miracle Strip Pkwy, Ft. Walton Beach, Fla., the Niceville Library, 100 Armstrong Ave., Niceville, Fla., and the Robert Sikes Library, 805 James Lee Blvd., Crestview, Fla. Copies will be available for review from May 18 through June 18, 2001. Agencies and the public are invited to provide written comments on issues or concerns they might have with these proposed actions. Comments must be received by June 25, 2001 to be considered.

For more information or to comment on this proposed action, contact:
Mr. Jonathan Farthing
HQ AFCEE/ECA
3207 North Road
Brooks AFB, TX 78235-5363
or Email:
Charlie.Brown@hqafcee.brooks.af.mil
or call:
(210) 536-3787
(210) 536-3890 (FAX)

APPENDIX G

AIRSPACE ANALYSIS

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APPENDIX G
AIRSPACE ANALYSIS

There are two categories of airspace or airspace areas above the U.S. They are regulatory and non-regulatory. Within these two categories, the Federal Aviation Administration (FAA) has designated four types of airspace: controlled; special use; other; and uncontrolled. The categories and types of airspace are dictated by the density of aircraft movement, nature of the operation, level of safety required, and national and public interest. Controlled airspace is the generic term that identifies five different classifications of airspace. These classes define the aviation activity within that airspace and pilot qualification requirements, and specify the equipment necessary to operate within the airspace. Special use airspace is regulated airspace within which flight activities must be confined by their nature, or where operating limitations are placed on non-participating aircraft. Prohibited areas, restricted areas, warning areas, alert areas, and military operations areas (MOAs) are special use airspace areas and are depicted on aeronautical charts. Other airspace areas consist of airport advisory areas, military training routes (MTRs), parachute jump areas, and areas with specific or temporary flight limitations.

There are six distinct airspace categories established for the control of aircraft. Class A airspace is that airspace between 18,000 and 60,000 feet MSL. Class B airspace is controlled airspace from the surface to 10,000 feet MSL surrounding the nation’s busiest airports, within which all aircraft are subject to the operating rules and pilot and equipment requirements specified by the FAA. Class C airspace is that airspace from surface to 4,000 feet above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of instrument flight rule (IFR) operations or passenger enplanements wherein air traffic control (ATC) provides radar vectoring and sequencing on a full-time basis for all IFR and visual flight rule (VFR) aircraft. Class D airspace is normally that airspace from the surface to 2,500 feet above the airport elevation surrounding those airports with an operating tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to accommodate the procedures. Class E airspace is controlled airspace extending upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace up to but not including, 18,000 feet MSL, excluding Class A, Class B, Class C and Class D airspace. Class G airspace is uncontrolled airspace. The Class F designation is not used in the US. All airspace above 60,000 feet MSL is designated as Class E.

Federal airways are Class E airspace and are based on a centerline that extends from one navigational aid or an intersection to another navigational aid (or through several navigation aids or intersections) specified for the airway. Each airway includes the airspace within parallel boundary lines four miles either side of the centerline. The airway includes that airspace extending upward from 1,200 feet AGL to, but not including, 18,000 feet MSL.

Rules of flight and ATC procedures have been established which govern how aircraft must operate within each type of designated airspace. All aircraft operate under either IFR or VFR. IFR aircraft (primarily commercial, military aviation, and business-related general aviation) operate within controlled airspace and are tracked and separated by the ATC system. VFR aircraft (primarily general aviation light aircraft) are not normally tracked by ATC but fly under a "see and avoid" concept in which pilots are responsible for their own separation from other air traffic. Airspace around the busier airports is more stringently controlled and may require all aircraft (including VFR) to be in contact with and monitored by an ATC agency while transiting through the area or approaching and departing the airport.

Prohibited areas contain airspace within which the flight of an aircraft is prohibited. Prohibited Areas have been established for security or other reasons associated with the national welfare. Restricted areas contain airspace within which the flight of an aircraft, while not wholly prohibited, is subject to restrictions. Restricted areas denoted the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants. Warning areas are airspace extending from three nautical miles (NM) outward from the coast of the U.S., which contains activity that may be hazardous to nonparticipating aircraft. Alert areas inform nonparticipating pilots of areas that may contain a high volume of pilot training or an unusual type of aerial activity. MOAs have been established for the purposed of separating certain military training activities from air traffic operating under IFR. Nonparticipating IFR traffic may be cleared through a MOA when ATC can provide IFR separation. Pilots operating under VFR may transition a MOA. However, extreme caution should be used since no separation is provided by ATC.

The type and dimension of individual airspace areas established within a given region and their spatial and procedural relationship to each other is contingent upon the different aviation activities conducted in that region. When any significant change is planned for this region, such as airport expansion, a new military flight mission, etc., the FAA will reassess the airspace configuration to determine if such changes will adversely affect (1) air traffic control systems or facilities; (2) movement of other air traffic in the area; (3) airspace already designated and used for other purposes (i.e. MOAs, Low Altitude Tactical Navigation [LATN] areas, or restricted areas). Therefore, considering the limited availability of airspace for air traffic purposes, the given region may or may not be able to accommodate any significant airport or airspace area expansion plans.

A given geographical area may also encompass several different types of airspace that apply not only to normal IFR and VFR aircraft operations, but to military flight training operations as well. MOAs and restricted areas are the most common types of airspace that have been designated for defense related activities. In addition there are military LATN flight training areas within controlled airspace and below the floor of the federal airway system. The purpose of a LATN area is to provide aircrews an area of sufficient size to allow random selection of navigation points for routes to drop zones that encounter a variety of terrain and provide more realistic and flexible low-level training.

Although not designated as special use airspace, the FAA and DoD have established MTRs to allow military aircrews to accomplish navigation training. There are three types of MTRs. Routes flown using IFR procedures (IR routes) allow aircraft to operate below 10,000 feet MSL at speeds in excess of 250 knots (288 mph) along DoD/FAA mutually developed and published routes in IFR conditions. Routes flown using VFR procedures (VR routes) are guided by the same restrictions as IR routes but are limited to VFR conditions. SR routes are slow speed low altitude training routes that operate below 1,500 feet AGL at airspeeds of 250 knots (288 mph) or less. Guidance for development and publication of SR routes is provided in applicable DoD directives.

Runways are identified by magnetic orientation and the direction of aircraft traffic. Thus, Runway 18 has a magnetic orientation of 180 degrees and traffic flowing in a southeasterly direction. Each runway has two ends, and the number for one end is 180 degrees different than the other end. Therefore, a single runway oriented 180 degrees/360 degrees and is identified as Runway 18/36. When traffic is flowing to the north, Runway 36 is in use; when traffic flow is to the south, Runway 18 is used. Some airports have two or three parallel runways. To differentiate the runways, they are identified as Left (L), Right (R), and Center (C) (in those cases where there are three runways). Thus, an airfield oriented

180 degrees/360 degrees with two parallel runways is identified as Runway 18L/36R and 18R/36L, while three parallel runways are identified as Runways 18L/36R, 18C/36C, and 18R/36L.

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APPENDIX H

THREATENED, ENDANGERED, AND SPECIES OF SPECIAL CONCERN TABLES

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Table H-1

Summary of Protected Species Identified at Hurlburt Field

Common name	Scientific Name	Status	
		Federal	State[1]
Fish			
Saltmarsh topminnow	*Fundulus jenkinsi*	-	SSC
Bluenose shiner	*Pteronotropis welaka*	-	SSC
Amphibians			
Flatwood salamander	*Ambystoma cingulatum*	T	**-**
Pine barrens treefrog	*Hyla andersonii*	-	SSC
Gopher frog	*Rana capito*	-	SSC
Gopher frog	*Rana capito*	-	SSC
Bog frog	*Rana okaloosae*	-	SSC
Reptiles			
American alligator	*Alligator mississippiensis*	T(S/A)	SSC
Atlantic loggerhead turtle	*Caretta caretta caretta*	T	T
Atlantic green turtle	*Chelonia mydas mydas*	E	E
Eastern indigo snake	*Drymarchon corais couperi*	T	T
Gopher tortoise	*Gopherus polyphemus*	-	SSC
Alligator snapping turtle	*Macroclemys temminckii*	-	SSC
Florida pine snake	*Pituophis melanoleucus mugitus*	-	SSC
Birds			
Southeastern snowy plover	*Charadrius alexandrinus tenuirostris*	T	T
Piping plover	*Charadrius melodus*	T	T
Marian's marsh wren	*Cistothorus palustris marianae*	-	SSC
Little blue heron	*Egretta caerulea*	-	SSC
Reddish egret	*Egretta rufescens*	-	SSC
Snowy egret	*Egretta thula*	-	SSC
Tricolored heron	*Egretta tricolor*	-	SSC
White ibis	*Eudocimus albus*	-	SSC
Peregrine falcon	*Falco peregrinus tundris*	-	E

Table H-1

Summary of Protected Species Identified at Hurlburt Field

Common name	**Scientific Name**	**Status**	
		Federal	**State**[1]
Southeastern American kestrel	*Falco sparverius paulus*	-	T
American oystercatcher	*Haematopus palliatus*	-	SSC
Bald eagle	*Haliaeetus leucocephalus*	T	T
Wood stork	*Mycteria americana*	E	E
Brown pelican	*Pelecanus occidentalis*	-	SSC
Red-cockaded woodpecker	*Picoides borealis*	E	T
Black skimmer	*Rynchops niger*	-	SSC
Least tern	*Sterna antillarum*	-	T
Bachman's warbler	*Vermivora bachmanii*	E	E
Mammals			
Florida black bear	*Ursus americanus floridanus*	**-**	T
Plants			
Hairy wild indigo	*Baptisia hirsuta*	-	T
Curtiss' sand grass	*Calamovilfa curtissii*	-	T
Many-flowered grass pink	*Calopogon multiflorus*	-	E
Baltzell's sedge	*Carex baltzellii*	-	T
Cruise's golden aster	*Chrysopsis cruiseana*	-	E
Perforate reindeer lichen	*Cladonia perforata*	E	E
Spoon-leaved sundew	*Drosera intermedia*	-	T
Panhandle spiderlily	*Hymenocallis henryae*	-	E
Florida anise	*Illicium floridanum*	-	T
Southern red lily	*Lilium catesbaei*	-	T
Panhandle lily	*Lilium iridollae*	-	E
Bog spicebush	*Lindera subcoriacea*	-	E
West's flax	*Linum westii*	-	E
Pondspice	*Litsea aestivalis*	-	E
Gulfcoast lupine	*Lupinus westianus*	-	T
Hummingbird flower	*Macranthera flammea*	-	E

Table H-1

Summary of Protected Species Identified at Hurlburt Field

Common name	Scientific Name	Status	
		Federal	**State[1]**
Chapman's butterwort	*Pinguicula planifolia*	-	T
Yellow fringeless orchid	*Platanthera integra*	-	E
Snowy orchid	*Platanthera nivea*	-	T
Large-leaved jointweed	*Polygonella macrophylla*	-	T
Small-flowered meadowbeauty	*Rhexia parviflora*	-	E
Orange azalea	*Rhododendron austrinum*	-	E
White-top pitcherplant	*Sarracenia leucophylla*	-	E
Parrot pitcherplant	*Sarracenia psittacina*	-	T
Sweet pitcherplant	*Sarracenia rubra*	-	T
Lace-lip ladies'-tresses	*Spiranthes laciniata*	-	T
Lesser ladies'-tresses	*Spiranthes ovalis*	-	E
Karst pond xyris	*Xyris longisepala*	-	E
Harper's yellow-eyed grass	*Xyris scabrifolia*	-	T

Notes:

1= All plant species listed according to the Florida Department of Agriculture and Consumer Services
T=Threatened
T(SA) = Treatened/Similarity of Appearance
E= Endangered
SSC= Species of Special Concern
CH = Critical Habitat

Source: Integrated Natural resources Management Plan - Hurlburt Field, 1996; Rare Plant, Rare Vertebrate, and Natural Community Survey if Air Force Special Operations Command, Hurlburt Field, Florida, 1997: Florida Fish and Wildlife Conservation Commission *Florida's Endangered Species, Threatened Species and Species of Special Concern*, 1997: and

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Endangered Species of Alabama

Alabama--107 species as of 09/22/2000

Animals--88 species

E = Endangered
T = Threatened

Source of this list is the U.S. FISH AND WILDLIFE SERVICE DIVISION OF ENDANGERED SPECIES

Alabama -- 107 listings

Animals -- 88

Status	***Listing***
E	Acornshell, southern (*Epioblasma othcaloogensis*)
T(S/A)	Alligator, American (*Alligator mississippiensis*)
T	Bankclimber, purple (*Elliptoideus sloatianus*)
E	Bat, gray (*Myotis grisescens*)
E	Bat, Indiana (*Myotis sodalis*)
E	Blossom, turgid (*Epioblasma turgidula*)
E	Blossom, yellow (*Epioblasma florentina florentina*)
E	Campeloma, slender (*Campeloma decampi*)
E	Catspaw (*Epioblasma obliquata obliquata*)
E	Cavefish, Alabama (*Speoplatyrhinus poulsoni*)
T	Chub, spotfin Entire (*Cyprinella monacha*)
E	Clubshell, black (*Pleurobema curtum*)
E	Clubshell, ovate (*Pleurobema perovatum*)
E	Clubshell, southern (*Pleurobema decisum*)
E	Combshell, Cumberlandian (*Epioblasma brevidens*)
E	Combshell, southern (*Epioblasma penita*)
E	Combshell, upland (*Epioblasma metastriata*)
E	Darter, boulder (*Etheostoma wapiti*)
T	Darter, goldline (*Percina aurolineata*)
T	Darter, slackwater (*Etheostoma boschungi*)
T	Darter, snail (*Percina tanasi*)
E	Darter, watercress (*Etheostoma nuchale*)
T	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
T	Elimia, lacy (*Elimia crenatella*)
E	Fanshell (*Cyprogenia stegaria*)
T	Heelsplitter, Alabama (*Potamilus inflatus*)
E	Kidneyshell, triangular (*Ptychobranchus greeni*)
E	Lampmussel, Alabama (*Lampsilis virescens*)
E	Lilliput, pale (*Toxolasma cylindrellus*)
E	Lioplax, cylindrical (*Lioplax cyclostomaformis*)
E	Manatee, West Indian (*Trichechus manatus*)
T	Moccasinshell, Alabama (*Medionidus acutissimus*)
E	Moccasinshell, Coosa (*Medionidus parvulus*)
E	Moccasinshell, Gulf (*Medionidus penicillatus*)
E	Monkeyface, Cumberland (*Quadrula intermedia*)
E	Mouse, Alabama beach (*Peromyscus polionotus ammobates*)
E	Mouse, Perdido Key beach (*Peromyscus polionotus trissyllepsis*)
T	Mucket, orangenacre (*Lampsilis perovalis*)
E	Mucket, pink (*Lampsilis abrupta*)

E	Mussel, oyster (*Epioblasma capsaeformis*)
E	Pearlymussel, cracking (*Hemistena lata*)
E	Pearlymussel, dromedary (*Dromus dromas*)
E	Pearlymussel, littlewing (*Pegias fabula*)
E	Pearlymussel, white wartyback (*Plethobasus cicatricosus*)
E	Pebblesnail, flat (*Lepyrium showalteri*)
E	Pigtoe, dark (*Pleurobema furvum*)
E	Pigtoe, finerayed (*Fusconaia cuneolus*)
E	Pigtoe, flat (*Pleurobema marshalli*)
E	Pigtoe, heavy (*Pleurobema taitianum*)
E	Pigtoe, oval (*Pleurobema pyriforme*)
E	Pigtoe, rough (*Pleurobema plenum*)
E	Pigtoe, shiny (*Fusconaia cor*)
E	Pigtoe, southern (*Pleurobema georgianum*)
E	Pimpleback, orangefoot (*Plethobasus cooperianus*)
T	Plover, piping (except Great Lakes watershed) (*Charadrius melodus*)
T	Pocketbook, finelined (*Lampsilis altilis*)
E	Pocketbook, shinyrayed (*Lampsilis subangulata*)
E	Ring pink (*Obovaria retusa*)
E	Riversnail, Anthony's (*Athearnia anthonyi*)
T	Rocksnail, painted (*Leptoxis taeniata*)
E	Rocksnail, plicate (*Leptoxis plicata*)
T	Rocksnail, round (*Leptoxis ampla*)
T	Salamander, flatwoods (*Ambystoma cingulatum*)
T	Salamander, Red Hills (*Phaeognathus hubrichti*)
T	Sculpin, pygmy (*Cottus pygmaeus*)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)
E	Sea turtle, leatherback (*Dermochelys coriacea*)
T	Sea turtle, loggerhead (*Caretta caretta*)
T	Shiner, blue (*Cyprinella caerulea*)
E	Shiner, Cahaba (*Notropis cahabae*)
E	Shiner, palezone (*Notropis albizonatus*)
E	Shrimp, Alabama cave (*Palaemonias alabamae*)
T	Slabshell, Chipola (*Elliptio chipolaensis*)
E	Snail, armored (*Pyrgulopsis pachyta*)
E	Snail, tulotoma (*Tulotoma magnifica*)
T	Snake, eastern indigo (*Drymarchon corais couperi*)
E	Stirrupshell (*Quadrula stapes*)
E	Stork, wood (AL, FL, GA, SC) (*Mycteria americana*)
E	Sturgeon, Alabama (*Scaphirhynchus suttkusi*)
T	Sturgeon, Gulf (*Acipenser oxyrinchus desotoi*)
T	Tortoise, gopher (W of of Mobile/Tombigbee Rs.) (*Gopherus polyphemus*)
E	Turtle, Alabama red-belly (*Pseudemys alabamensis*)
T	Turtle, flattened musk (species range clarified) (*Sternotherus depressus*)
E	Whale, finback (*Balaenoptera physalus*)
E	Whale, humpback (*Megaptera novaeangliae*)
E	Woodpecker, red-cockaded (*Picoides borealis*)

Plants -- 19

Status	***Listing***
T	Amphianthus, little (*Amphianthus pusillus*)
T	Potato-bean, Price's (*Apios priceana*)

T	Fern, American hart's-tongue (*Asplenium scolopendrium americanum*)
E	Leather flower, Morefield's (*Clematis morefieldii*)
E	Leather flower, Alabama (*Clematis socialis*)
E	Prairie-clover, leafy (*Dalea foliosa*)
T	Sunflower, Eggert's (*Helianthus eggertii*)
T	Bladderpod, lyrate (*Lesquerella lyrata*)
E	Pondberry (*Lindera melissifolia*)
T	Button, Mohr's Barbara (*Marshallia mohrii*)
E	Harperella (*Ptilimnium nodosum*)
T	Water-plantain, Kral's (*Sagittaria secundifolia*)
E	Pitcher-plant, green (*Sarracenia oreophila*)
E	Pitcher-plant, Alabama canebrake (*Sarracenia rubra alabamensis*)
E	Chaffseed, American (*Schwalbea americana*)
E	Pinkroot, gentian (*Spigelia gentianoides*)
T	Fern, Alabama streak-sorus (*Thelypteris pilosa alabamensis*)
E	Trillium, relict (*Trillium reliquum*)
E	Grass, Tennessee yellow-eyed (*Xyris tennesseensis*)

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Table H-4

Summary of Protected Plant Species for North Carolina

Common name	**Scientific Name**	**Status**
Joint-vetch, sensitive	_*Aeschynomene virginica*	T
Amaranth, seabeach	_*Amaranthus pumilus*	T
Bittercress, small-anthered	_*Cardamine micranthera*	E
Coneflower, smooth	_*Echinacea laevigata*	E
Avens, spreading	_*Geum radiatum*	E
Lichen, rock gnome	_*Gymnoderma lineare*	E
Bluet, Roan Mountain	_*Hedyotis purpurea montana*	E
Sunflower, Schweinitz's	_*Helianthus schweinitzii*	E
Pink, swamp	_*Helonias bullata*	T
Heartleaf, dwarf-flowered	_*Hexastylis naniflora*	T
Heather, mountain golden	_*Hudsonia montana*	T
Pogonia, small whorled	_*Isotria medeoloides*	T
Blazingstar, Heller's	_*Liatris helleri*	T
Pondberry	_*Lindera melissifolia*	E
Loosestrife, rough-leaved	_*Lysimachia asperulaefolia*	E
Dropwort, Canby's	_*Oxypolis canbyi*	E
Harperella	_*Ptilimnium nodosum*	E
Sumac, Michaux's	_*Rhus michauxii*	E
Arrowhead, bunched	_*Sagittaria fasciculata*	E
Pitcher-plant, green	_*Sarracenia oreophila*	E
Pitcher-plant, mountain sweet	_*Sarracenia rubra jonesii*	E
Chaffseed, American	_*Schwalbea americana*	E
Irisette, white	_*Sisyrinchium dichotomum*	E
Goldenrod, Blue Ridge	_*Solidago spithamaea*	T
Spiraea, Virginia	_*Spiraea virginiana*	T
Meadowrue, Cooley's	_*Thalictrum cooleyi*	E

Summary of Protected Animal Species for North Carolina
Endangered Species List

Common Name	Scientific Name
Federally-listed Species	
Birds	
American peregrine falcon	Falco peregrinus anatum
Bachman's warbler	Vermivora bachmanii
Bald eagle	Haliaeetus leucocephalus
Ivory-billed woodpecker	Campephilus principalis
Kirtland's warbler	Dendroica kirtlandi
Red-cockaded woodpecker	Picoides borealis
Roseate tern	Sterna d. dougallii
Wood stork	Mycteria americana
Fish	
Cape fear shiner	Notropis mekistocholas
Shortnose sturgeon (when found in inland fishing waters)	Acipenser brevirostrum
Mammals	
Carolina northern flying squirrel	Glaucomys sabrinus coloratus
Eastern cougar	Felis concolor cougar
Gray bat	Myotis grisescens
Indiana bat	Myotis sodalis
Manatee (when found in inland fishing waters)	Trichechus manatus
Virginia big-eared bat	Plecotus t. townsendii
Mollusks	
Carolina heelsplitter	Lasmigona decorata
Dwarf wedge mussel	Alasmidonta heterodon
Little-wing perlymussel	Pegias fabula
Tar river spiny mussel	Elliptio {canthyria} steinstansana
Reptiles	
Atlantic ridley turtle	Lepidochelys kempii
Hawksbill turtle	Eretmochelys imbricata
Leatherback turtle	Dermochelys coriacea
State-listed Endangered Species	
Amphibians	
Green salamander	Aneides aeneus
Birds	
Bewick's wren	Thryomanes bewickii
Catlips minnow	Exoglossum maxillingua
Dusky darter	Percina sciera
Orangefin madtom	Noturus gilberti

Paddlefish	Polyodon spatula
Rustyside sucker	Moxostoma hamiltoni
Stonecat	Noturus flavus
Mollusks	
Appalachian elktoe	Alasmidonta raveneliana
Barrel floater	Anodonta couperiana
Fragile glyph	Glyphyalinia clingmani
Green floater	Lasmigona subviridus
Knotty elimia	Goniobasis interrupta
Magnificent rams-horn	Planorbella magnifica
Neus spike	Elliptio judithae
Pistolgrip	Tritigonia verrucosa
Slippershell mussel	Alasmidonta viridis
Tennessee hellsplitter	Lasmigona holstonia
Tennessee pigtoe	Fusconaia barnesiana
Federally-listed Threatened Species	
Birds	
Arctic peregrin falcon	Falco peregrinus tundris
Piping plover	Chardrius melodus
Fish	
Sportfin chub	Hybopsis monacha
Waccamaw silverside	Menidia extensa
Mammals	
Dismal swamp southern shrew	Sorex longirostris fisheri
Mollusks	
Noonday globe	Mesodon clarki nantahala
Reptiles	
American alligator	Alligator mississipiensis
Green turtle	Chelonia mydas
Loggerhead turtle	Caretta caretta
State-listed Threatened Species	
Amphibians	
Eastern tiger salamander	Ambystoma t. tigrinum
Wehrle's salamander	Plethodon wehrlei
Birds	
Gull-billed tern	Gelochelidon nilotica aranea
Fish	
American Brook lamprey	Lampetra appendix
Banded sculpin	Cottus carolinae
Carolina pygmy sunfish	Elassoma boehlkei
Freshwater drum	Aplodinotus grunniens
Logperch	Percina caprodes
Rosyface chub	Hybopsis rubrinfrons
Sharphead darter	Etheostoma acuticeps
Striped shiner	Notropis chrysochephalus

Waccamaw darter	Etheostoma perlongum
Mammals	
Eastern wood rat	Neotoma f. floridana
Mollusks	
Atlantic pigtoe	Fusconaia masoni
Big-tooth covert	Mesodon jonestianus
Brook floater	Alasmidonta varicosa
Cape Fear spike	Elliptio marsupiobesa
Cape Fear threetooth	Triodopsis soelneri
Clingman covert	Mesodon clingmanicus
Engraved covert	Mesodon orestes
Mountain creekshell	Villosa varnuxemensis
Roan supercoil	Paravitrea varidens
Roanoke slabshell	Elliptio roanokensis
Savannah lilliput	Toxolasma pullus
Sculpted supercoil	Paravitrea ternaria
Seep mudalia	Leptoxis dilatata
Smoky Mountain covert	Mesodon ferrissi
Squawfoot	Strophitus undulatus
Triangle floater	Alasmidonta undulata
Waccamaw ambersnail	Catinella waccamawensis
Waccamaw fatmucket	Lampsilis fullerkati
Waccamaw spike	Elliptio waccamawensis
Yellow lampmussel	Lampsilis cariosa
Yellow lance	Elliptio lanceolata
Reptiles	
Bog turtle	Clemmys muhlenbergii
State-listed Special Concern Species	
Amphibians	
Carolina crawfish frog	Rana areolata capito
Crevice salamander	Plethodon longicrus
Dwarf salamander	Eurycea quadridigitata
Eastern hellbender	Cryptobranchus a. allenganiensis
Four-toed salamander	Hemidactylium scutatum
Junaluska salamander	Eurycea junaluska
Longtail salamander	Eurycea l. longicauda
Mole salamander	Ambystoma talpoideum
Mountain chorus frog	Pseudacris brachyphona
Mudpuppy	Necturus maculosus
Neuse river waterdog	Necturus lewisi
River frog	Rana heckscheri
Weller's salamander	Plethodon dorsalis
Birds	
Bachman's sparrow	Aimophila aestivalis
Black-capped chicadee	Parus atricapillus

Black skimmer	Rhynchops niger
Brown pelican	Plecanus occidentalis
Black vulture	Coragyps atratus
Cooper’s hawk	Accipiter cooperi
Glossy ibis	Plegadis falcinellus
Golden-crowned kinglet	Regulus satrapa
Little blue heron	Egretta caerulea
Loggerhead shrike	Lanius ludovicianus
Northern saw –whet owl	Aegolius acadicus
Olive-sided flycatcher	Contopus borealis
Snowy egret	Egretta thula
Tricolor heron	Egretta tricolor
Fish	
Atlantic sturgeon	Acipenser oxyrhynchus
Bigeye junprock	Moxostoma ariommum
Bluefin killifish	Lucania goodei
Blueside darter	Etheostoma jessiae
Bridle shiner	Notropis bifrenatus
Broadtail madtom (Lumber River and its tributaries and Cape Fear River and its tributaries)	Noturus n. sp.
Carolina darter	Etheostoma collis
Carolina madtom (Neuse River and its tributaries)	Noturus furiosus
Highfin carpsucker	Carpiodes velifer
Kanawha minnow	Phenacobius teretulus
Lake sturgeon	Acipenser fulvescens
Least brook lamprey	Lampetra aepyptera
Least killifish	Heterandria fomosa
Longhead darter	Percina macrocephala
Mooneye	Hiodon tergisus
Mountain madtom	Noturus eleutherus
Olive darter	Percina squamata
Pinewoods darter	Etheostoma mariae
River carpsucker	Carpiodes carpio
River redhorse (Pee Dee River and its tributaries)	Moxostoma carinatum
Riverweed darter	Etheostoma podostemone
Rosyside dace (Little Tennessee River and its tributaries)	Clinostomus funduloides ssp.
Sandhills chub	Semotilus lumbee
Sharpnose darter	Percina oxyrhyncha
Tennessee snubnose darter	Etheostoma simoterum
Thinlip chub (Lumbar and Cape Fear Rivers and their tributaries)	Hybopsis sp.

Turquiose darter	Etheostoma inscriptum
Waccamaw killifish	Fundulus waccamensis
Wounded darter	Etheostoma vulneratum
Yellowfin shiner (Savannah and Little Tennessee Rivers and their tributaries)	Notropis lutippinnis
Mammals	
Brazilian free-tailed bat	Tadarida brasiliensis cynocephala
Eastern wood rat	Netomoa floridana haemitora and N.f. magister
Keen’s bat	Myotis keenii septentrionalis
Long-tailed shrew	Sorex dispar blitchi
Pygmy shrew	Sorex hoyi winnemana
Rafinesque’s big-eared bat	Plecotus r. rafinesquii and P.r. macrotis
Rock vole	Mic5otus chrotorrhinus carolinensis
Small-footed bat	Myotis l. liebi
Southeastern bat	Myotis austroriparius
Star-nosed mole	Condylura cristata parva
Water shrew	Sorex palustris punctulatus
Mollusks	
Alabama rainbow	Villosa nebulosa
Alewife floater	Anodonta implicata
Appalachian floss	Zonitoides patuloides
Bidentate dome	Ventridens coelaxis
Black mantleslug	Pallifera hemphilli
Blackwater ancylid	Ferrissia hendersoni
Blue-foot lancetooth	Haplotrema kendeighi
Carolina creekshell	Villosa vaughanianus
Carolina elktoe	Alasmidonta robusta
Dark glyph	Glyphyaliana
Dwarf proud globe	Mesodon clarki
Eastern lampmussel	Lampsilis radiata
Eastern pondmussel	Ligumia nastuta
Fringed coil	Helicodiscus fimbriatus
Glossy supercoil	Paravitrea placentula
Great Smoky slitmouth	Stenotrema depilatum
Greenfield rams-horn	Helisoma eucosmium
High mountain supercoil	Paravitrea andrewsae
Honey glyph	Glyphyalinia vanattai
Lamellate supercoil	Paravitrea lamellidens
Mirey Ridge supercoil	Paravitrea clappi
Open supercoil	Paravitrea umbilicaris
Pink glyph	Glyphyalinia pentadelphia
Pod lance	Elliptio folliculata
Queen crater	Mesodon chilhoweensis
Ramp Cove supercoil	Paravitrea lacteodens

Saw-tooh disc	Discus bryanti
Spike	Elliptio dilatata
Spiral coil	Helicodiscus bonamicus
Tidewater mucket	Lampsilis ochracea
Velvet covert	Mesodon subpalliatus
Waccamaw amnicola	Amnicola sp.
Waccamaw lampmussel	Lampsilis crocata
Waccamaw siltsnail	Cincinnatia sp.
Wavy-rayed lampmussel	Lampsilis fasciola
Reptiles	
Carolina salt marsh snake	Nerodia sipedon williamengelsi
Diamondback terrapin	Malacelmys terrapin
Eastern smooth green snake	Opheidrys v. vernalis
Eastern spiny softshell	Apalone s. spinifera
Mimic glass lizard	Ophisaurus mimicus
Northern pine snake	Pituophis m. melanoleucus
Outer banks kingsnake	Lampropeltis getulus sticticeps
Stripeneck musk turtle	Sternotherus minor peltifer

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South Carolina Rare, Threatened & Endangered Species Inventory

All Species Found In South Carolina

Data Last Updated June 26, 2000.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	LEGAL STATUS
ACCIPITER COOPERII	COOPER'S HAWK	G5	S?	SC
ACER PENSYLVANICUM	STRIPED MAPLE	G5	S1S2	SC
ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON	G3	S3	FE/SE
ACONITUM UNCINATUM	BLUE MONKSHOOD	G4	S2	SC
ACRIS CREPITANS CREPITANS	NORTHERN CRICKET FROG	G5T5	S5	SC
AESCULUS PARVIFLORA	SMALL-FLOWERED BUCKEYE	G2G3	S1	RC
AGALINIS APHYLLA	COASTAL PLAIN FALSE-FOXGLOVE	G3G4	S?	SC
AGALINIS AURICULATA	EARLEAF FOXGLOVE	G3	S1	SC
AGALINIS LINIFOLIA	FLAX LEAF FALSE-FOXGLOVE	G4?	S?	SC
AGALINIS MARITIMA	SALT-MARSH FALSE-FOXGLOVE	G5	S?	SC
AGALINIS TENELLA		G4Q	S?	SC
AGARISTA POPULIFOLIA	CAROLINA DOG-HOBBLE	G4G5	S1	SC
AGRIMONIA INCISA	INCISED GROOVEBUR	G3	S1	NC
AGRIMONIA PUBESCENS	SOFT GROOVEBUR	G5	S1	SC
AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW	G3	S3	SC
ALASMIDONTA VARICOSA	BROOK FLOATER	G3	S?	SC
ALETRIS OBOVATA	WHITE COLICROOT	G4G5	S?	SC
ALLIUM CERNUUM	NODDING ONION	G5	S?	SC
ALLIUM CUTHBERTII	STRIPED GARLIC	G3G4	S?	SC
AMARANTHUS PUMILUS	SEABEACH AMARANTH	G2	S1	FT/ST
AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER	G2G3	S1	FT/SE
AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER	G5T5	S2S3	SC
AMORPHA GEORGIANA VAR GEORGIANA	GEORGIA LEADPLANT	G3T2	S?	SC
AMORPHA GLABRA	SMOOTH INDIGOBUSH	G4?	S?	SC
AMORPHA SCHWERINII	SCHWERIN INDIGOBUSH	G3	S1	SC
AMPHIANTHUS PUSILLUS	POOL SPRITE	G2	S1	FT/ST
AMPHICARPUM MUEHLENBERGIANUM	BLUE MAIDEN-CANE	G4	S?	SC
ANDROPOGON BRACHYSTACHYUS	SHORT-SPIKE BLUESTEM	G4	S?	SC
ANDROPOGON MOHRII	BROOMSEDGE	G4?	S?	SC
ANDROPOGON PERANGUSTATUS	NARROW LEAVED BLUESTEM	G5T3T4	S1	SC
ANEIDES AENEUS	GREEN SALAMANDER	G3G4	S1	SC

ANEMONE BERLANDIERI	SOUTHERN THIMBLE-WEED	G4?	S?	SC
ANEURA MAXIMA	ANEURA	G4?	S?	SC
ANODONTA COUPERIANA	BARREL FLOATER	G4	S?	SC
ANTHAENANTIA RUFA	PURPLE SILKYSCALE	G5	S?	SC
APALONE FEROX	FLORIDA SOFTSHELL	G5	S?	SC
ARABIS MISSOURIENSIS	MISSOURI ROCK-CRESS	G4?Q	S1	SC
ARETHUSA BULBOSA	BOG ROSE	G4	S1	RC
ARISTIDA BEYRICHIANA	BEYRICH'S THREE-AWN	G?	S?	SC
ARISTIDA CONDENSATA	PIEDMONT THREE-AWNED GRASS	G4?	S?	SC
ARISTIDA SPICIFORMIS	PINE BARREN THREE-AWNED GRASS	G4	SR	SC
ARISTOLOCHIA MACROPHYLLA	PIPEVINE	G5	S2	SC
ARISTOLOCHIA TOMENTOSA	WOOLLY DUTCHMAN'S-PIPE	G5	S?	SC
ARNOGLOSSUM MUEHLENBERGII	GREAT INDIAN PLANTAIN	G4	S?	SC
ASCLEPIAS CONNIVENS	LARGE-FLOWER MILKWEED	G4?	S?	SC
ASCLEPIAS PEDICELLATA	SAVANNAH MILKWEED	G3?	S1	RC
ASPLENIUM BRADLEYI	BRADLEY'S SPLEENWORT	G4	S1	RC
ASPLENIUM HETERORESILIENS	WAGNER'S SPLEENWORT	G2Q	S1	NC
ASPLENIUM MONANTHES	SINGLE-SORUS SPLEENWORT	G4	S1	RC
ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT	G4	S1	SC
ASPLENIUM RESILIENS	BLACK-STEM SPLEENWORT	G5	S1S2	SC
ASPLENIUM RHIZOPHYLLUM	WALKING-FERN SPLEENWORT	G5	S2	SC
ASPLENIUM TRICHOMANES	MAIDENHAIR SPLEENWORT	G5	S?	SC
ASTER AVITUS	ALEXANDER'S ROCK ASTER	G3	S1	NC
ASTER ELLIOTTII	ELLIOTT'S ASTER	G3G4	S?	SC
ASTER GEORGIANUS	GEORGIA ASTER	G2G3	S?	SC
ASTER LAEVIS	SMOOTH BLUE ASTER	G5	S?	SC
ASTER NOVAE-ANGLIAE	NEW ENGLAND ASTER	G5	S?	SC
ASTER SPECTABILIS	SHOWY ASTER	G5	S?	SC
ASTRAGALUS MICHAUXII	SANDHILLS MILKVETCH	G3	S?	SC
ASTRAGALUS VILLOSUS	A MILK-VETCH	G4	S?	SC
ATRYTONE AROGOS	AROGOS SKIPPER	G3G4	S?	SC
BACOPA CYCLOPHYLLA	COASTAL-PLAIN WATER-HYSSOP	G3G5	S1	SC
BALDUINA ATROPURPUREA	PURPLE BALDUINA	G2G3	S?	SC
BALDUINA UNIFLORA	ONE-FLOWER BALDUINA	G4	S?	SC
BAPTISIA LANCEOLATA	LANCE-LEAF WILD-INDIGO	G4?	S?	SC
BETULA ALLEGHANIENSIS	YELLOW BIRCH	G5	S1	SC
BOTRYCHIUM LUNARIOIDES	WINTER GRAPE-FERN	G4?	S?	SC
BOYKINIA ACONITIFOLIA	BROOK SAXIFRAGE	G4	S1	SC
BURMANNIA BIFLORA	NORTHERN BURMANNIA	G4G5	S?	SC
CALAMOVILFA BREVIPILIS	PINE-BARRENS REED-GRASS	G4	S?	NC
CALOPOGON BARBATUS	BEARDED GRASS-PINK	G4?	S?	SC
CALOPOGON MULTIFLORUS	MANY-FLOWER GRASS-PINK	G3	SR	SC
CAMASSIA SCILLOIDES	WILD HYACINTH	G4G5	S2	RC
CAMPANULA AMERICANA	TALL BELLFLOWER	G5	S1	SC
CANNA FLACCIDA	BANDANA-OF-THE-EVERGLADES	G4?	S4	SC

CARDAMINE CLEMATITIS	MOUNTAIN BITTER CRESS	G2G3	S?	SC
CARDAMINE DISSECTA	DIVIDED TOOTHWORT	G4?	S?	SC
CARDAMINE FLAGELLIFERA	BITTER CRESS	G3	S?	SC
CARETTA CARETTA	LOGGERHEAD	G3	S3	FT/ST
CAREX AMPHIBOLA	NARROWLEAF SEDGE	G5	S?	SC
CAREX AMPLISQUAMA	FORT MOUNTAIN SEDGE	G3	S?	SC
CAREX APPALACHICA	APPALACHIAN SEDGE	G4	S?	SC
CAREX AUSTROCAROLINIANA	SOUTH CAROLINA SEDGE	G4	S?	SC
CAREX BASIANTHA		G5	SR	
CAREX BILTMOREANA	BILTMORE SEDGE	G3	S1	NC
CAREX CANESCENS SSP DISJUNCTA	SILVERY SEDGE	G5T4?	S?	SC
CAREX CHAPMANII	CHAPMAN'S SEDGE	G3	S1	NC
CAREX CHEROKEENSIS	CHEROKEE SEDGE	G4G5	SR	SC
CAREX COLLINSII	COLLINS' SEDGE	G4	S1	SC
CAREX CRUS-CORVI		G5		
CAREX DECOMPOSITA	CYPRESS-KNEE SEDGE	G3	S?	SC
CAREX ELLIOTTII	ELLIOTT'S SEDGE	G4?	S?	SC
CAREX FOLLICULATA	LONG SEDGE	G4G5	S1	SC
CAREX GRACILESCENS	SLENDER SEDGE	G5?	S?	SC
CAREX GRACILLIMA	GRACEFUL SEDGE	G5	S?	SC
CAREX GRANULARIS	MEADOW SEDGE	G5	S?	SC
CAREX JAMESII	NEBRASKA SEDGE	G5	S?	SC
CAREX MANHARTII	MANHART SEDGE	G3	S?	SC
CAREX OLIGOCARPA	EASTERN FEW-FRUIT SEDGE	G4	S?	SC
CAREX PEDUNCULATA	LONGSTALK SEDGE	G5	S1	SC
CAREX PLANTAGINEA	PLANTAIN-LEAVED SEDGE	G5	S?	SC
CAREX PRASINA	DROOPING SEDGE	G4	S?	SC
CAREX PROJECTA	NECKLACE SEDGE	G5	S?	SC
CAREX RADFORDII		G2	S1?	N?
CAREX SCABRATA	ROUGH SEDGE	G5	S?	SC
CAREX SOCIALIS		G4	S?	
CAREX STRICTA	TUSSOCK SEDGE	G5	S?	SC
CAREX WOODII	PRETTY SEDGE	G4	S?	SC
CAROLINA BAY		G?	S?	SC
CARYA MYRISTICIFORMIS	NUTMEG HICKORY	G4	S1	RC
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH	G5	S2	RC
CAULOPHYLLUM THALICTROIDES	BLUE COHOSH	G5	S2	SC
CAYAPONIA BOYKINII	CAYAPONIA	G4	S?	SC
CHAMAEDAPHNE CALYCULATA	LEATHERLEAF	G5	S?	SC
CHARADRIUS WILSONIA	WILSON'S PLOVER	G5	S3?	ST
CHASMANTHIUM NITIDUM	SHINY SPIKEGRASS	G3?	S?	SC
CHEILOLEJEUNEA EVANSII	EVAN'S CHEILOLEJEUNEA	G1	S1	SC
CHELONE LYONII	PINK TURTLEHEAD	G4	S?	SC
CHRYSOMA PAUCIFLOSCULOSA	WOODY GOLDENROD	G4G5	S1S2	SC
CHRYSOSPLENIUM	AMERICAN GOLDEN-SAXIFRAGE	G5	S1	SC

AMERICANUM				
CIMICIFUGA AMERICANA	MOUNTAIN BUGBANE	G5	S?	SC
CIRCAEA LUTETIANA	SOUTHERN BROADLEAF ENCHANTER'S NIGHTSHADE	G5	S?	SC
CIRCAEA LUTETIANA SSP CANADENSIS	ENCHANTER'S NIGHTSHADE	G5T5	S1	SC
CLADIUM MARISCOIDES	TWIG RUSH	G5	S1	SC
CLADRASTIS KENTUKEA	YELLOWWOOD	G4	S1	RC
CLEMMYS GUTTATA	SPOTTED TURTLE	G5	S5	SC
CLEMMYS MUHLENBERGII	BOG TURTLE	G3	S1	FT/ST
CLETHRIONOMYS GAPPERI	SOUTHERN RED-BACKED VOLE	G5	S2S3	SC
CLETHRIONOMYS GAPPERI CAROLINENSIS	CAROLINA RED-BACKED VOLE	G5T4	S2S3	SC
CLIFTONIA MONOPHYLLA	BUCKWHEAT-TREE	G4G5	S?	SC
COLLINSONIA SEROTINA		G3G4		
COLLINSONIA VERTICILLATA	WHORLED HORSE-BALM	G3	S?	SC
COLONIAL WATERBIRD		G?	S?	SC
COMPTONIA PEREGRINA	SWEET FERN	G5	S?	SC
CONDYLURA CRISTATA	STAR-NOSED MOLE	G5	S3?	SC
CONVALLARIA MONTANA	AMERICAN LILY-OF-THE-VALLEY	G4	S?	SC
COREOPSIS GLADIATA	SOUTHEASTERN TICKSEED	G3G5	S?	SC
COREOPSIS INTEGRIFOLIA	CILIATE-LEAF TICKSEED	G1G2	SR	SC
COREOPSIS LATIFOLIA	BROAD-LEAVED TICKSEED	G3	S1	NC
COREOPSIS ROSEA	ROSE COREOPSIS	G3	S2	RC
CORNUS RACEMOSA	STIFF DOGWOOD	G5?	S1	SC
CORYNORHINUS RAFINESQUII	RAFINESQUE'S BIG-EARED BAT	G3G4	S2?	SE
CROTALUS ADAMANTEUS	EASTERN DIAMONDBACK RATTLESNAKE	G4	S3	SC
CROTALUS HORRIDUS	TIMBER RATTLESNAKE	G4	S?	SC
CROTON ELLIOTTII	ELLIOTT'S CROTON	G2G3	S?	SC
CROTONOPSIS LINEARIS	NARROWLEAF RUSHFOIL	G5	S?	SC
CRYPTOBRANCHUS ALLEGANIENSIS	HELLBENDER	G4	S?	SC
CUSCUTA CEPHALANTHI	DODDER; LOVE-VINE	G5	S?	SC
CUSCUTA INDECORA	DODDER; LOVE-VINE	G5	S?	SC
CYNANCHUM SCOPARIUM	LEAFLESS SWALLOW-WORT	G4	S?	SC
CYPERUS DISTINCTUS	MARSHLAND FLATSEDGE	G4	S1	SC
CYPERUS GRANITOPHILUS	GRANITE-LOVING FLATSEDGE	G3Q	S?	SC
CYPERUS LECONTEI	LECONTE FLATSEDGE	G4?	S?	SC
CYPERUS TETRAGONUS	PIEDMONT FLATSEDGE	G4?	S1	SC
CYPRIPEDIUM PUBESCENS	LARGE YELLOW LADY'S-SLIPPER	G5	S?	SC
CYSTOPTERIS BULBIFERA	BULBLET FERN	G5	S?	SC
CYSTOPTERIS PROTRUSA	LOWLAND BRITTLE FERN	G5	S?	SC
DANTHONIA EPILIS	BOG OAT-GRASS	G3?	S?	SC
DASISTOMA MACROPHYLLA	MULLEIN FOXGLOVE	G4	S?	SC
DELPHINIUM CAROLINIANUM	CAROLINA LARKSPUR	G5	S?	SC
DENDROICA VIRENS	BLACK-THROATED GREEN	G5	S4	SC

	WARBLER			
DESCHAMPSIA FLEXUOSA	CRINKLED HAIRGRASS	G5	S?	SC
DESMOGNATHUS AENEUS	SEEPAGE SALAMANDER	G3G4	S?	SC
DICENTRA CUCULLARIA	DUTCHMAN'S BREECHES	G5	S1	SC
DICENTRA EXIMIA	WILD BLEEDING-HEART	G4	S?	SC
DICERANDRA ODORATISSIMA	ROSE BALM	G4G5	S1	SC
DICHANTHELIUM ACICULARE	BROOMSEDGE	G4G5	S?	SC
DIONAEA MUSCIPULA	VENUS' FLY-TRAP	G3	S1	RC
DIPHYLLEIA CYMOSA	UMBRELLA-LEAF	G4	S1	RC
DIPLAZIUM PYCNOCARPON	GLADE FERN	G5	S1	SC
DIRCA PALUSTRIS	EASTERN LEATHERWOOD	G4	S?	SC
DISTOCAMBARUS YOUNGINERI	A CRAYFISH	G1	S1	SC
DODECATHEON MEADIA	SHOOTING-STAR	G5	S?	SC
DRABA APRICA	OPEN-GROUND WHITLOW-GRASS	G3	S1	NC
DRABA REPTANS	CAROLINA WHITLOW-GRASS	G5	S?	SC
DRYOPTERIS CARTHUSIANA		G5		
DRYOPTERIS GOLDIANA	GOLDIE'S WOODFERN	G4	S1	SC
DRYOPTERIS INTERMEDIA	EVERGREEN WOODFERN	G5	S?	SC
DRYOPTERIS SPINULOSA	SPINULOSE WOOD-FERN	G5	S?	SC
ECHINACEA LAEVIGATA	SMOOTH CONEFLOWER	G2	S1	FE/SE
ECHINODORUS PARVULUS	DWARF BURHEAD	G3	S2	SC
ECHINODORUS TENELLUS	DWARF BURHEAD	G5	S?	NRF
ELANOIDES FORFICATUS	AMERICAN SWALLOW-TAILED KITE	G5	S2	SE
ELASSOMA BOEHLKEI	CAROLINA PYGMY SUNFISH	G2	S1	ST
ELASSOMA OKATIE	BLUEBARRED PYGMY SUNFISH	G2G3	S?	SC
ELEOCHARIS PALUSTRIS	SPIKE-RUSH	G5	S?	SC
ELEOCHARIS ROBBINSII	ROBBINS SPIKERUSH	G4G5	S?	SC
ELEOCHARIS ROSTELLATA	BEAKED SPIKERUSH	G5	S?	SC
ELEOCHARIS TRICOSTATA	THREE-ANGLE SPIKERUSH	G4	SR	SC
ELEOCHARIS VIVIPARA	VIVIPAROUS SPIKE-RUSH	G5	S?	SC
ELIMIA CATENARIA	GRAVEL ELIMIA	G?	S?	SC
ELLIPTIO CONGARAEA	CAROLINA SLABSHELL	G4	S?	SC
ELLIPTIO LANCEOLATA	YELLOW LANCE	G2G3	S?	SC
ELYMUS RIPARIUS	WILD-RYE	G5	S?	SC
ENEMION BITERNATUM	FALSE RUE-ANEMONE	G5	S1	RC
EPIDENDRUM CONOPSEUM	GREEN-FLY ORCHID	G4	S?	SC
ERIOCAULON TEXENSE	PIPEWORT	G4	S?	SC
ERIOCHLOA MICHAUXII	CUPGRASS	G3G4	S?	SC
ERYNGIUM AQUATICUM VAR RAVENELII	MARSH ERYNGO	G4TUQ	S?	SC
ETHEOSTOMA COLLIS	CAROLINA DARTER	G3	S?	SC
ETHEOSTOMA FLABELLARE	FANTAIL DARTER	G5	S1	SC
ETHEOSTOMA HOPKINSI	CHRISTMAS DARTER	G4G5	S4	SC
EUMECES ANTHRACINUS PLUVIALIS	SOUTHERN COAL SKINK	G5T5	S?	ST
EUONYMUS ATROPURPUREUS	WAHOO	G5	S1	SC

EUPATORIUM ANOMALUM	FLORIDA THOROUGH-WORT	G2G3	SR	SC
EUPATORIUM FISTULOSUM	HOLLOW JOE-PYE WEED	G5?	S?	SC
EUPATORIUM RECURVANS	COASTLA-PLAIN THOROUGH-WORT	G3G4Q	SR	SC
EUPATORIUM RESINOSUM	PINE BARRENS BONESET	G3	S?	SC
EUPATORIUM SCABRIDUM		G5T?	SR	SC
EUPATORIUM SESSILIFOLIUM VAR VASEYI	THOROUGHWORT	G5T?	S?	SC
FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON	G4T3	S?	FE/SE
FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS	G2	S2	NC
FIMBRISTYLIS VAHLII	VAHL FIMBRY	G5	S?	SC
FORESTIERA GODFREYI	GODFREY'S PRIVET	G3	S?	SC
FORESTIERA LIGUSTRINA	UPLAND SWAMP PRIVET	G4G5	S1	SC
FORESTIERA SEGREGATA	SOUTHERN PRIVET	G4?	S1	SC
FOTHERGILLA MAJOR	MOUNTAIN WITCH-ALDER	G3	S1	RC
FRASERA CAROLINIENSIS	COLUMBO	G5	S1	RC
FUNDULUS DIAPHANUS	BANDED KILLIFISH	G5	S1	SC
GALACTIA ELLIOTTII	ELLIOTT'S MILKPEA	G5	SR	SC
GALEARIS SPECTABILIS	SHOWY ORCHIS	G5	S?	SC
GAULTHERIA PROCUMBENS	TEABERRY	G5	S1	SC
GAURA BIENNIS	BIENNIAL GAURA	G5	S?	SC
GAYLUSSACIA BACCATA	BLACK HUCKLEBERRY	G5	S?	SC
GAYLUSSACIA MOSIERI	WOOLLY-BERRY	G4	S?	SC
GENTIANA AUTUMNALIS	PINE BARREN GENTIAN	G3	S2	SC
GOPHERUS POLYPHEMUS	GOPHER TORTOISE	G3	S1	SE
GYMNODERMA LINEARE	ROCKY GNOME LICHEN	G2	S1	FE/SE
HABENARIA QUINQUESETA	LONG-HORN ORCHID	G4G5	S?	SC
HACKELIA VIRGINIANA	VIRGINIA STICKSEED	G5	S?	SC
HALESIA DIPTERA	TWO-WING SILVERBELL	G5	S1	SC
HALESIA PARVIFLORA	SMALL-FLOWERED SILVERBELL-TREE	G?	S?	SC
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4	S2	FT/SE
HELENIUM BREVIFOLIUM	SHORTLEAF SNEEZEWEED	G3G4	S1	RC
HELENIUM PINNATIFIDUM	SOUTHEASTERN SNEEZEWEED	G4	S?	SC
HELIANTHEMUM GEORGIANUM	GEORGIA FROSTWEED	G4	S?	SC
HELIANTHUS GLAUCOPHYLLUS	WHITE-LEAVED SUNFLOWER	G3	S?	NC
HELIANTHUS LAEVIGATUS	SMOOTH SUNFLOWER	G4	S?	SC
HELIANTHUS PORTERI	PORTER'S GOLDENEYE	G4	S1	SC
HELIANTHUS SCHWEINITZII	SCHWEINITZ'S SUNFLOWER	G2	S1	FE/SE
HELONIAS BULLATA	SWAMP-PINK	G3	S1	FT/ST
HEPATICA ACUTILOBA	LIVERLEAF	G5	S?	SC
HETERANTHERA RENIFORMIS	KIDNEYLEAF MUD-PLANTAIN	G5	S?	SC
HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE	G2	S?	SC
HEUCHERA PARVIFLORA	LITTLE-LEAVED ALUMROOT	G4	S?	SC
HEXASTYLIS NANIFLORA	DWARF-FLOWERED HEARTLEAF	G2	S2	FT/ST
HOTTONIA INFLATA	FEATHERFOIL	G4	S?	SC
HUDSONIA ERICOIDES	GOLDEN-HEATHER	G4	S1	RC

HYDRANGEA CINEREA	ASHY-HYDRANGEA	G4	S?	SC
HYDROCOTYLE AMERICANA	AMERICAN WATER-PENNYWORT	G5	S?	SC
HYDROLEA CORYMBOSA	CORYMB FIDDLELEAF	G5	S1	SC
HYDROPHYLLUM CANADENSE	BLUNT-LEAF WATERLEAF	G5	S1	SC
HYLA ANDERSONII	PINE BARRENS TREEFROG	G4	S2S3	ST
HYLA AVIVOCA	BIRD-VOICED TREEFROG	G5	S5	SC
HYMENOCALLIS CORONARIA	SHOALS SPIDER-LILY	G2Q	S2	NC
HYMENOPHYLLUM TAYLORIAE	TAYLOR'S FERN	G1G2	S1	SC
HYMENOPHYLLUM TUNBRIGENSE	TUNBRIDGE FERN	G4G5	S1	NC
HYPERICUM ADPRESSUM	CREEPING ST. JOHN'S-WORT	G2G3	S1	RC
HYPERICUM HARPERI		G3	S?	N3
HYPERICUM NITIDUM	CAROLINA ST. JOHN'S-WORT	G4	S?	SC
ICTINIA MISSISSIPPIENSIS	MISSISSIPPI KITE	G5	S4	SC
ILEX AMELANCHIER	SARVIS HOLLY	G4	S3	SC
IMPATIENS PALLIDA	PALE JEWEL-WEED	G5	S?	SC
IPOMOEA MACRORHIZA	LARGE-STEM MORNING-GLORY	G3G5	S1?	SC
IPOMOEA STOLONIFERA	BEACH MORNING-GLORY	G5?	S?	SC
IPOMOPSIS RUBRA	RED STANDING-CYPRESS	G4G5	S?	SC
IRIS HEXAGONA	WALTER'S IRIS	G4G5	S?	SC
ISOETES CAROLINIANA	ENGELMANN'S QUILLWORT	G3Q	S?	SC
ISOETES MELANOSPORA	BLACK-SPORED QUILLWORT	G1	S1	FE/SE
ISOETES PIEDMONTANA	PIEDMONT QUILLWORT	G3	S2	SC
ISOETES RIPARIA	RIVER BANK QUILLWORT	G5?	S1	SC
ISOTRIA MEDEOLOIDES	SMALL WHORLED POGONIA	G2G3	S1	FT/ST
JUGLANS CINEREA	BUTTERNUT	G3G4	S?	SC
JUNCUS ABORTIVUS	PINEBARREN RUSH	G4G5	S?	SC
JUNCUS GEORGIANUS	GEORGIA RUSH	G4	S?	SC
JUNCUS GYMNOCARPUS	NAKED-FRUITED RUSH	G4	S?	SC
JUNCUS SUBCAUDATUS	WOODS-RUSH	G5	S?	SC
JUNGERMANNIA FOSSOMBRONIOIDES	JUNGERMANNIA	G4	S?	SC
JUNIPERUS COMMUNIS	GROUND JUNIPER	G5	S?	SC
KALMIA CUNEATA	WHITE-WICKY	G3	S1	NC
KINOSTERNON BAURII	STRIPED MUD TURTLE	G5	S?	SC
KOGIA BREVICEPS	PYGMY SPERM WHALE	G4	SA	SC
KRIGIA MONTANA	FALSE DANDELION	G3	S?	SC
LACHNOCAULON BEYRICHIANUM	SOUTHERN BOG-BUTTON	G2G3	S?	SC
LACHNOCAULON MINUS	SMALL'S BOG BUTTON	G3G4	SR	SC
LAMPROPELTIS TRIANGULUM	MILK SNAKE	G5	S2	SC
LAMPSILIS CARIOSA	YELLOW LAMPMUSSEL	G3G4	S?	SC
LAMPSILIS SPLENDIDA	RAYED PINK FATMUCKET	G3	S?	SC
LANIUS LUDOVICIANUS	LOGGERHEAD SHRIKE	G5	S3	SC
LASIURUS CINEREUS	HOARY BAT	G5	S?	SC
LASIURUS INTERMEDIUS	NORTHERN YELLOW BAT	G4G5	S?	SC
LASMIGONA DECORATA	CAROLINA HEELSPLITTER	G1	S1	FE/SE

LECHEA TORREYI	PIEDMONT PINWEED	G4G5	S?	SC
LEPUROPETALON SPATHULATUM	SOUTHERN LEPUROPETALON	G5?	S?	SC
LEUROGNATHUS MARMORATUS	SHOVELNOSE SALAMANDER	G4	S2	SC
LIATRIS MICROCEPHALA	SMALL-HEAD GAYFEATHER	G3G4	S?	SC
LICANIA MICHAUXII	GOPHER-APPLE	G4G5	S?	SC
LILAEOPSIS CAROLINENSIS	CAROLINA LILAEOPSIS	G3?	S1	NC
LILIUM CANADENSE	CANADA LILY	G5	S1?	SC
LILIUM IRIDOLLAE	PANHANDLE LILY	G1G2	S1	SC
LIMNOTHLYPIS SWAINSONII	SWAINSON'S WARBLER	G4	S4	SC
LINDERA MELISSIFOLIA	PONDBERRY	G2	S1	FE/SE
LINDERA SUBCORIACEA	BOG SPICEBUSH	G2	S?	RC
LIPARIS LILIIFOLIA	LARGE TWAYBLADE	G5	S?	SC
LIPOCARPHA MICRANTHA	DWARF BULRUSH	G4	S2	SC
LISTERA AUSTRALIS	SOUTHERN TWAYBLADE	G4	S?	SC
LISTERA SMALLII	KIDNEY-LEAF TWAYBLADE	G4	S?	SC
LITHOSPERMUM TUBEROSUM	TUBEROUS GROMWELL	G4	S1	SC
LITSEA AESTIVALIS	PONDSPICE	G3	S3	SC
LOBELIA BOYKINII	BOYKIN'S LOBELIA	G2G3	S?	SC
LOBELIA SP 1	LOBELIA	G?	S?	SC
LONICERA FLAVA	YELLOW HONEYSUCKLE	G5?	S2	SC
LOPHOCOLEA APPALACHIANA	APPALACHIAN LOPHOCOLEA	G1G2Q	S1	SC
LUDWIGIA LANCEOLATA	LANCE-LEAF SEEDBOX	G3	SR	SC
LUDWIGIA SPATHULATA	SPATULATE SEEDBOX	G2G4	S?	SC
LYCOPODIUM POROPHILUM	ROCK CLUBMOSS	G4	S1	SC
LYCOPODIUM TRISTACHYUM	DEEP-ROOT CLUBMOSS	G5	S1	SC
LYCOPUS COKERI	CAROLINA BUGLEWEED	G3	S?	SC
LYGODIUM PALMATUM	CLIMBING FERN	G4	S1S2	SC
LYONIA FERRUGINEA	RUSTY LYONIA	G5	S1	SC
LYSIMACHIA ASPERULIFOLIA	ROUGH-LEAVED LOOSESTRIFE	G3	S1	FE/SE
LYSIMACHIA FRASERI	FRASER LOOSESTRIFE	G2	S1	RC
LYSIMACHIA HYBRIDA	LANCE-LEAF LOOSESTRIFE	G5	S1	SC
MACBRIDEA CAROLINIANA	CAROLINA BIRD-IN-A-NEST	G2G3	S?	SC
MACROMIA MARGARITA	MARGARET'S RIVER CRUISER	G2G3	S?	SC
MAGNOLIA CORDATA	PIEDMONT CUCUMBER TREE	G?Q	S?	SC
MAGNOLIA MACROPHYLLA	BIGLEAF MAGNOLIA	G5	S?	SC
MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA	G4	S1	RC
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER	G5	S?	SC
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER	G5	S?	SC
MENISPERMUM CANADENSE	CANADA MOONSEED	G5	S?	SC
MICROTUS PENNSYLVANICUS	MEADOW VOLE	G5	S4	SC
MICRURUS FULVIUS	EASTERN CORAL SNAKE	G5	S2	SC
MINUARTIA UNIFLORA	ONE-FLOWER STITCHWORT	G4	S?	SC
MITELLA DIPHYLLA	TWO-LEAF BISHOP'S-CAP	G5	S?	SC
MONADNOCK		G?	S?	SC
MONARDA DIDYMA	OSWEGO TEA	G5	S?	SC

MONOTROPSIS ODORATA	SWEET PINESAP	G3	S1	RC
MUHLENBERGIA FILIPES	BENTGRASS; HAIRGRASS	G?Q	S?	SC
MYCTERIA AMERICANA	WOOD STORK	G4	S1S2	FE/SE
MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS	G3G4	S2S3	ST
MYOTIS LEIBII	EASTERN SMALL-FOOTED MYOTIS	G3	S1	ST
MYOTIS LUCIFUGUS	LITTLE BROWN MYOTIS	G5	S3?	SC
MYOTIS SEPTENTRIONALIS	NORTHERN MYOTIS	G4	S3S4	SC
MYOTIS SODALIS	INDIANA MYOTIS	G2	S1	FE/SE
MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL	G3	S2	RC
NAJAS FLEXILIS	SLENDER NAIAD	G5	S?	SC
NAPAEOZAPUS INSIGNIS	WOODLAND JUMPING MOUSE	G5	S4?	SC
NEOTOMA FLORIDANA	EASTERN WOODRAT	G5	S3S4	SC
NEOTOMA FLORIDANA FLORIDANA	EASTERN WOODRAT	G5T5	S3S4	SC
NEOTOMA FLORIDANA HAEMATOREIA	SOUTHERN APPALACHIAN WOODRAT	G5T4Q	S3S4	SC
NERODIA CYCLOPION	GREEN WATER SNAKE	G5	S2	SC
NERODIA FLORIDANA	FLORIDA GREEN WATER SNAKE	G5	S2	SC
NESTRONIA UMBELLULA	NESTRONIA	G4	S2	SC
NOLINA GEORGIANA	GEORGIA BEARGRASS	G3G5	S?	SC
NOTROPIS CHILITICUS	REDLIP SHINER	G4	S1?	SC
NYSSA OGECHE	OGEECHEE TUPELO	G4G5	S?	SC
OENOTHERA LINIFOLIA	THREAD-LEAF SUNDROPS	G5	S?	SC
OENOTHERA PERENNIS	SMALL SUNDROPS	G5	S?	SC
OPHIOGLOSSUM PETIOLATUM	LONGSTEM ADDER'S-TONGUE FERN	G5	S?	SC
OPHIOGLOSSUM VULGATUM	ADDER'S-TONGUE	G5	S?	SC
OPHISAURUS COMPRESSUS	ISLAND GLASS LIZARD	G3G4	S1S2	SC
OPHISAURUS MIMICUS	MIMIC GLASS LIZARD	G3	S?	SC
ORBEXILUM LUPINELLUM	SAMPSON SNAKEROOT; SCURF PEA	G3G4	S?	SC
OROBANCHE UNIFLORA	ONE-FLOWERED BROOMRAPE	G5	S?	SC
OSMORHIZA CLAYTONII	HAIRY SWEET-CICELY	G5	S?	SC
OUTCROP		G?	S?	SC
OXYPOLIS CANBYI	CANBY'S DROPWORT	G2	S1	FE/SE
OXYPOLIS TERNATA	PIEDMONT COWBANE	G3	S?	SC
PACHYSANDRA PROCUMBENS	ALLEGHENY-SPURGE	G4G5	S1	RC
PANAX QUINQUEFOLIUS	AMERICAN GINSENG	G4	S2S3	RC
PANICUM NEURANTHUM		G5?	SR	SC
PANICUM WEBBERIANUM	A PANICGRASS	G5T5	SR	SC
PARASCALOPS BREWERI	HAIRY-TAILED MOLE	G5	S?	SC
PARNASSIA ASARIFOLIA	KIDNEYLEAF GRASS-OF-PARNASSUS	G4	S1	RC
PARNASSIA CAROLINIANA	CAROLINA GRASS-OF-PARNASSUS	G3	S1S2	NC
PARNASSIA GRANDIFOLIA	LARGE-LEAVED GRASS-OF-PARNASSUS	G3G4	S2	RC
PARONYCHIA AMERICANA	AMERICAN NAILWORT	G3?	S?	SC

PASPALUM BIFIDUM	BEAD-GRASS	G5	S?	SC
PELECANUS OCCIDENTALIS	BROWN PELICAN	G4	S1S2	SC
PELLAEA ATROPURPUREA	PURPLE-STEM CLIFF-BRAKE	G5	S1	SC
PELLAEA WRIGHTIANA	CLIFF-BRAKE FERN	G5	S?	SC
PELLIA APPALACHIANA	APPALACHIAN PELLIA	G1?	S1	SC
PELTANDRA SAGITTIFOLIA	SPOON-FLOWER	G3G4	S?	SC
PHACELIA BIPINNATIFIDA	FERNLEAF PHACELIA	G5	S1	SC
PHILADELPHUS HIRSUTUS	STREAMBANK MOCK-ORANGE	G5	S1	SC
PHOCA VITULINA	HARBOR SEAL	G5	SA	SC
PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON-HEAD	G4?	S?	SC
PICOIDES BOREALIS	RED-COCKADED WOODPECKER	G3	S2	FE/SE
PIERIS PHILLYREIFOLIA	CLIMBING FETTER-BUSH	G3	S?	SC
PILEA FONTANA	SPRINGS CLEARWEED	G5	S?	SC
PINCKNEYA PUBENS	HAIRY FEVER-TREE	G3G4	S1	SC
PITUOPHIS MELANOLEUCUS	PINE OR GOPHER SNAKE	G4	S3S4	SC
PITUOPHIS MELANOLEUCUS MUGITUS	FLORIDA PINE SNAKE	G4T3?	S2	SC
PITYOPSIS PINIFOLIA	PINE-LEAVED GOLDEN ASTER	G4	S?	SC
PLAGIOCHILA CADUCILOBA	GORGE LEAFY LIVERWORT	G2	S?	SC
PLAGIOCHILA SULLIVANTII		G2	S?	SC
PLAGIOMNIUM CAROLINIANUM	MOUNTAIN WAVY-LEAF MOSS	G3	S?	SC
PLANTAGO SPARSIFLORA	PINELAND PLANTAIN	G2G3	S?	SC
PLATANTHERA INTEGRA	YELLOW FRINGELESS ORCHID	G3G4	S2	SC
PLATANTHERA INTEGRILABIA	WHITE FRINGELESS ORCHID	G2G3	S1	NC
PLATANTHERA LACERA	GREEN-FRINGE ORCHIS	G5	S1	SC
PLATANTHERA PERAMOENA	PURPLE FRINGELESS ORCHID	G5	S?	RC
PLEEA TENUIFOLIA	RUSH FALSE-ASPHODEL	G4	S?	SC
PLEGADIS FALCINELLUS	GLOSSY IBIS	G5	S?	ST
PLETHODON WEBSTERI	WEBSTER'S SALAMANDER	G3	S2	SE
POA ALSODES	BLUE-GRASS	G4G5	S?	SC
POLYCENTROPUS CARLSONI	CARLSON'S POLYCENTROPUS CADDISFLY	G1G3	S1S3	SC
POLYGALA HOOKERI	MILKWORT	G3	S1	SC
POLYGALA NANA	DWARF MILKWORT	G5	S1S2	SC
POLYGALA PAUCIFOLIA	GAY-WING MILKWORT	G5	S1	SC
PONTHIEVA RACEMOSA	SHADOW-WITCH ORCHID	G4G5	S?	SC
PORELLA JAPONICA SSP APPALACHIANA		G?T1	S1	SC
PORTULACA SMALLII	SMALL'S PURSLANE	G3	S?	SC
PORTULACA UMBRATICOLA	WING-PODDED PURSLANE	G5	S1	SC
POTAMOGETON CONFERVOIDES	ALGAE-LIKE PONDWEED	G3G4	S1	SC
POTAMOGETON FOLIOSUS	LEAFY PONDWEED	G5	S?	SC
PRUNUS ALABAMENSIS	ALABAMA BLACK CHERRY	G4	S?	SC
PSEUDACRIS TRISERIATA	WESTERN CHORUS FROG	G5	S3S4	SC
PSEUDOBRANCHUS STRIATUS	DWARF SIREN	G5	S2	ST
PSEUDOTRITON MONTANUS	GULF COAST MUD SALAMANDER	G5T4	S3S4	SC

FLAVISSIMUS				
PSILOTUM NUDUM	WHISK FERN	G5	S1S2	SC
PTEROGLOSSASPIS ECRISTATA	CRESTED FRINGED ORCHID	G2	S2	SC
PTILIMNIUM NODOSUM	HARPERELLA	G2	S1	FE/SE
PYCNANTHEMUM MONTANUM	SINGLE-HAIRED MOUNTAIN-MINT	G3G5	S1	RC
PYCNANTHEMUM NUDUM	PINELANDS MOUNTAIN MINT	G5?	S?	SC
PYGANODON CATARACTA	EASTERN FLOATER	G5	S?	SC
PYXIDANTHERA BARBULATA	FLOWERING PIXIE-MOSS	G4	S1	NC
PYXIDANTHERA BARBULATA VAR BARBULATA	WELL'S PYXIE MOSS	G4T4	S?	SC
PYXIDANTHERA BREVIFOLIA	WELL'S PIXIE-MOSS	G2Q	S2	NC
QUERCUS BICOLOR	SWAMP WHITE OAK	G5	S1	SC
QUERCUS DURANDII	DURAND'S WHITE OAK	G5	S1	SC
QUERCUS MYRTIFOLIA	MYRTLE-LEAF OAK	G5	S?	SC
QUERCUS OGLETHORPENSIS	OGLETHORPE'S OAK	G3	S3	SC
QUERCUS SIMILIS	BOTTOM-LAND POST OAK	G4Q	SR	SC
RANA CAPITO	GOPHER FROG	G3G4	S1	SC
RANA PALUSTRIS	PICKEREL FROG	G5	S?	SC
RANA SYLVATICA	WOOD FROG	G5	S3	SC
RANUNCULUS FASCICULARIS	EARLY BUTTERCUP	G5	S?	SC
RATIBIDA PINNATA	GRAY-HEAD PRAIRIE CONEFLOWER	G5	S?	SC
RHAPIDOPHYLLUM HYSTRIX	NEEDLE PALM	G4	S?	SC
RHEXIA ARISTOSA	AWNED MEADOWBEAUTY	G3	S2	SC
RHEXIA CUBENSIS	WEST INDIAN MEADOW-BEAUTY	G4G5	SR	SC
RHINICHTHYS ATRATULUS	BLACKNOSE DACE	G5	S1	SC
RHIZOMNIUM APPALACHIANUM	LARGE-LEAVED MNIUM	G5	S?	SC
RHODODENDRON CATAWBIENSE	CATAWBA RHODODENDRON	G5	S?	SC
RHODODENDRON FLAMMEUM	PIEDMONT AZALEA	G3	S2	SC
RHYNCHOSPORA ALBA	WHITE BEAKRUSH	G5	S1	SC
RHYNCHOSPORA BREVISETA	SHORT-BRISTLE BALDRUSH	G3	S?	N?
RHYNCHOSPORA CAREYANA	HORNED BEAKRUSH	G4?Q	SR	SC
RHYNCHOSPORA CEPHALANTHA VAR ATTENUATA		G5T3?	SR	
RHYNCHOSPORA GLOBULARIS VAR PINETORUM	BEAKRUSH	G5T3?	S?	SC
RHYNCHOSPORA HARPERI	HARPER BEAKRUSH	G4?	S?	SC
RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH	G3G4	S?	SC
RHYNCHOSPORA LEPTOCARPA		G3	SR	
RHYNCHOSPORA MACRA	BEAK RUSH	G3	S?	SC
RHYNCHOSPORA OLIGANTHA	FEW-FLOWERED BEAKED-RUSH	G4	S?	SC
RHYNCHOSPORA PALLIDA	PALE BEAKRUSH	G3	S?	SC
RHYNCHOSPORA PLEIANTHA	BROWN BEAKED-RUSH	G2	S?	SC
RHYNCHOSPORA SCIRPOIDES	LONG-BEAKED BALDRUSH	G4	SR	SC
RHYNCHOSPORA STENOPHYLLA	CHAPMAN BEAKRUSH	G4	S?	SC

RHYNCHOSPORA TRACYI	TRACY BEAKRUSH	G4	S?	SC
RIBES ECHINELLUM	MICCOSUKEE GOOSEBERRY	G1	S1	FT/ST
RORIPPA SESSILIFLORA	STALKLESS YELLOWCRESS	G5	S?	SC
RUDBECKIA HELIOPSIDIS	SUN-FACING CONEFLOWER	G2	S1	NC
RUDBECKIA MOLLIS	SOFT-HAIR CONEFLOWER	G3G5	S1	SC
RUELLIA CAROLINIENSIS SSP CILIOSA	A PETUNIA	G5T?	S?	SC
RUELLIA PEDUNCULATA SSP PINETORUM	STALKED WILD PETUNIA	G5T3?	S?	SC
SABATIA BARTRAMII	BARTRAM'S ROSE-GENTIAN	G4G5	S?	SC
SABATIA KENNEDYANA	PLYMOUTH GENTIAN	G3	S1	RC
SAGERETIA MINUTIFLORA	TINY-LEAVED BUCKTHORN	G4	S2	SC
SAGITTARIA FASCICULATA	BUNCHED ARROWHEAD	G1	S1	FE/SE
SAGITTARIA GRAMINEA VAR WEATHERBIANA	GRASSLEAF ARROWHEAD	G5T2	S?	SC
SAGITTARIA ISOETIFORMIS	SLENDER ARROW-HEAD	G3G4	S2	SC
SANGUISORBA CANADENSIS	CANADA BURNET	G5	S?	SC
SANICULA TRIFOLIATA	LARGE-FRUITED SANICLE	G4	S1	SC
SARRACENIA RUBRA	SWEET PITCHER-PLANT	G3	S1	SC
SARRACENIA RUBRA SSP JONESII	MOUNTAIN SWEET PITCHER-PLANT	G3T1	S?	FE/SE
SAXIFRAGA CAREYANA	CAREY SAXIFRAGE	G3	S1	SC
SAXIFRAGA MICRANTHIDIFOLIA	LETTUCE-LEAF SAXIFRAGE	G5	S?	SC
SCHOENOLIRION CROCEUM	YELLOW SUNNYBELL	G4	S1	SC
SCHWALBEA AMERICANA	CHAFFSEED	G2	S2	FE/SE
SCIRPUS CESPITOSUS VAR CALLOSUS	TUSSOCK BULRUSH	G5T?	S?	SC
SCIRPUS ERISMANAE	A BULRUSH	G?Q	S?	SC
SCIRPUS ETUBERCULATUS	CANBY BULRUSH	G3G4	S?	SC
SCIRPUS SUBTERMINALIS	WATER BULRUSH	G4G5	S?	SC
SCIURUS NIGER	EASTERN FOX SQUIRREL	G5	S4	SC
SCLERIA BALDWINII	BALDWIN NUTRUSH	G4	S1S2	SC
SCLERIA RETICULARIS	RETICULATED NUTRUSH	G3G4	SR	SC
SCUTELLARIA PARVULA	SMALL SKULLCAP	G4	S?	SC
SEDUM PUSILLUM	GRANITE ROCK STONECROP	G3	S2	NC
SEMINATRIX PYGAEA	BLACK SWAMP SNAKE	G5	S?	SC
SEMOTILUS LUMBEE	SANDHILLS CHUB	G3	S2	SC
SENECIO MILLEFOLIUM	PIEDMONT RAGWORT	G2	S2	RC
SHORTIA GALACIFOLIA	OCONEE-BELLS	G2	S2	NC
SIDEROXYLON LANUGINOSUM	GUM BUMELIA	G4G5	S?	SC
SIDEROXYLON RECLINATUM		G4G5	S?	
SILENE OVATA	OVATE CATCHFLY	G2G3	S?	SC
SILPHIUM TEREBINTHINACEUM	PRAIRIE ROSINWEED	G4G5	S1	SC
SISYRINCHIUM DICHOTOMUM	REFLEXED BLUE-EYED GRASS	G2	S?	FE/SE
SMILAX BILTMOREANA	BILTMORE GREENBRIER	G3G4	S?	SC
SOLIDAGO AURICULATA	EARED GOLDENROD	G4	S?	SC

SOLIDAGO BICOLOR	WHITE GOLDENROD	G5	S1	SC
SOLIDAGO PTARMICOIDES	PRAIRIE GOLDENROD	G5	S?	SC
SOLIDAGO PULCHRA	CAROLINA GOLDENROD	G3	S?	SC
SOLIDAGO RIGIDA	PRAIRIE GOLDENROD	G5	S1	SC
SOLIDAGO VERNA	SPRING-FLOWERING GOLDENROD	G3	S1	NC
SOREX CINEREUS	CINEREUS OR MASKED SHREW	G5	S?	SC
SOREX FUMEUS	SMOKY SHREW	G5	S4	SC
SOREX HOYI	PYGMY SHREW	G5	S3S4	SC
SPILOGALE PUTORIUS	EASTERN SPOTTED SKUNK	G5	S4	SC
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES	G4G5	S1	SC
SPIRANTHES LONGILABRIS	GIANT SPIRAL LADIES'-TRESSES	G3	S?	SC
SPOROBOLUS CURTISSII	PINELAND DROPSEED	G3	SR	SC
SPOROBOLUS FLORIDANUS	FLORIDA DROPSEED	G3	SR	SC
SPOROBOLUS PINETORUM	CAROLINA DROPSEED	G3	SR	SC
SPOROBOLUS TERETIFOLIUS	WIRE-LEAVED DROPSEED	G1G2	S1	NC
STACHYS CLINGMANII	CLINGMAN'S HEDGE-NETTLE	G2Q	S1	SC
STACHYS TENUIFOLIA VAR LATIDENS	BROAD-TOOTHED HEDGE-NETTLE	G5TU	S1	SC
STERNA ANTILLARUM	LEAST TERN	G4	S3	
STEWARTIA OVATA	MOUNTAIN CAMELLIA	G4	S2	RC
STILLINGIA AQUATICA	CORKWOOD	G4G5	S1	SC
STROPHITUS UNDULATUS	SQUAWFOOT	G5	S?	SC
STYLISMA PICKERINGII VAR PICKERINGII	PICKERING'S MORNING-GLORY	G4T2T3	S1	SC
SYLVILAGUS AQUATICUS	SWAMP RABBIT	G5	S3	SC
SYLVILAGUS TRANSITIONALIS	NEW ENGLAND COTTONTAIL	G4	S2?	SC
SYNGONANTHUS FLAVIDULUS	YELLOW PIPEWORT	G5	S1	RC
TAMIASCIURUS HUDSONICUS	RED SQUIRREL	G5	S3?	SC
THALIA DEALBATA	POWDERY THALIA	G4	S?	SC
THALICTRUM SUBROTUNDUM	RECLINED MEADOW-RUE	G1G2Q	S1	SC
THELYPTERIS OVATA VAR OVATA		G3G5T?	SR	
THERMOPSIS MOLLIS	SOFT-HAIRED THERMOPSIS	G4?	S?	SC
THRYOMANES BEWICKII	BEWICK'S WREN	G5	S1?	SE
TIARELLA CORDIFOLIA VAR CORDIFOLIA	HEART-LEAVED FOAM FLOWER	G5T5	S?	SC
TOFIELDIA GLABRA	WHITE FALSE-ASPHODEL	G3	S?	SC
TORREYOCHLOA PALLIDA	PALE MANNA GRASS	G5?	S?	SC
TOXOLASMA PULLUS	SAVANNAH LILLIPUT	G2	S1S3	SC
TRADESCANTIA VIRGINIANA	VIRGINIA SPIDERWORT	G5	S?	SC
TRAUTVETTERIA CAROLINIENSIS	CAROLINA TASSEL-RUE	G5	S?	SC
TREPOCARPUS AETHUSAE	AETHUSA-LIKE TREPOCARPUS	G4G5	S?	SC
TRICHOMANES BOSCHIANUM	BRISTLE-FERN	G4	S1	RC
TRICHOMANES PETERSII	DWARF FILMY-FERN	G4G5	S2	RC
TRICHOSTEMA SP 1	DUNE BLUECURLS	G2	S?	SC
TRIDENS CAROLINIANUS	CAROLINA FLUFF GRASS	G3?	S?	SC

TRIDENS CHAPMANII	CHAPMAN'S REDTOP	G?	S?	SC
TRIDENS STRICTUS	LONG-SPIKE FLUFF GRASS	G5	SR	SC
TRILLIUM DISCOLOR	FADED TRILLIUM	G3	S?	SC
TRILLIUM GRANDIFLORUM	LARGE-FLOWER TRILLIUM	G5	S?	SC
TRILLIUM LANCIFOLIUM	NARROW-LEAVED TRILLIUM	G3	S1	NC
TRILLIUM PERSISTENS	PERSISTENT TRILLIUM	G1	S1	FE/SE
TRILLIUM PUSILLUM VAR PUSILLUM	LEAST TRILLIUM	G3T2	S1	NC
TRILLIUM RELIQUUM	RELICT TRILLIUM	G2	S1	FE/SE
TRILLIUM RUGELII	SOUTHERN NODDING TRILLIUM	G3	S?	SC
TRILLIUM SIMILE	A TRILLIUM	G3	S?	SC
TRILLIUM UNDULATUM	PAINTED TRILLIUM	G5	S?	SC
TRIPHORA TRIANTHOPHORA	NODDING POGONIA	G4	S2	SC
TYTO ALBA	BARN-OWL	G5	S4	SC
URSUS AMERICANUS	BLACK BEAR	G5	S3?	SC
URTICA CHAMAEDRYOIDES	WEAK NETTLE	G4G5	S?	SC
UTRICULARIA FLORIDANA	FLORIDA BLADDERWORT	G3G5	S1	SC
UTRICULARIA MACRORHIZA	GREATER BLADDERWORT	G5	SR	SC
UTRICULARIA OLIVACEA	PIEDMONT BLADDERWORT	G4	S1	SC
UTTERBACKIA IMBECILLIS	PAPER PONDSHELL	G5	S?	SC
VACCINIUM CRASSIFOLIUM SSP SEMPERVIRENS	RAYNER'S BLUEBERRY	G4G5T1	S1	NC
VALLISNERIA AMERICANA	EEL-GRASS	G5	S?	SC
VERBENA SIMPLEX	NARROW-LEAVED VERVAIN	G5	S?	SC
VERONICASTRUM VIRGINICUM	CULVER'S-ROOT	G5	S?	SC
VILLOSA CONSTRICTA	NOTCHED RAINBOW	G3	S?	SC
VILLOSA DELUMBIS	EASTERN CREEKSHELL	G4	S?	SC
VILLOSA VIBEX	SOUTHERN RAINBOW	G4Q	S?	SC
VIOLA CONSPERSA	AMERICAN BOG VIOLET	G5	S?	SC
VIOLA PUBESCENS VAR LEIOCARPON	YELLOW VIOLET	G5T5	S?	SC
VIOLA TRIPARTITA	THREE-PARTED VIOLET	G5	S?	SC
VIOLA TRIPARTITA VAR GLABERRIMA	THREE-PARTED VIOLET	G5T?	S?	SC
VIOLA TRIPARTITA VAR TRIPARTITA	THREE-PARTED VIOLET	G5T3?	S?	SC
WALDSTEINIA LOBATA	PIEDMONT STRAWBERRY	G2?	S2	RC
WAREA CUNEIFOLIA	NUTTALL WAREA	G4	S?	SC
WATERFALL		G?	S?	SC
XEROPHYLLUM ASPHODELOIDES	EASTERN TURKEYBEARD	G4	S1	SC
XYRIS BREVIFOLIA	SHORT-LEAVED YELLOW-EYED GRASS	G4G5	S?	SC
XYRIS CHAPMANII	CHAPMAN'S YELLOW-EYED GRASS	G3	S?	SC
XYRIS DIFFORMIS VAR FLORIDANA	FLORIDA YELLOW-EYED GRASS	G5T4T5	SR	SC
XYRIS ELLIOTTII	ELLIOTT YELLOW-EYED GRASS	G4	SR	SC

XYRIS FLABELLIFORMIS	SAVANNAH YELLOW-EYED GRASS	G4	SR	SC
XYRIS SCABRIFOLIA	HARPER'S YELLOW-EYED GRASS	G3	S?	SC
XYRIS SEROTINA	ACID-SWAMP YELLOW-EYED GRASS	G3G4	SR	SC
XYRIS STRICTA	PINELAND YELLOW-EYED GRASS	G3G4	SR	SC
XYRIS TORTA	TWISTED YELLOW-EYED-GRASS	G5	S?	SC
ZAPUS HUDSONIUS	MEADOW JUMPING MOUSE	G5	S?	SC

For detailed location information about rare & endangered species, please contact Julie Holling .

CV-22 Beddown at Hurlburt Field, Fl
Draft Final EA Comments
May 2001

CMT NBR	PAGE	SECTION	LINE	COMMENT	REVIEWER